THE ROLE OF PHYSICAL SCIENCE SUBJECT ADVISORS IN ENHANCING THE QUALITY OF THE TEACHING OF PHYSICAL SCIENCE IN THE FET PHASE (GRADE 10-12)

by

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Submitted in accordance with the requirement for a Doctoral degree with specialization in Curriculum Studies

at the

UNIVERSITY OF SOUTH AFRICA

31 January 2018

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ABSTRACT

Poor Physical Science performance in South African schools is due to ineffective Physical Science teaching. Quality Physical Science teaching stems from quality Physical Science subject advisory services. Traditionally interventions to raise teaching standards were done by inspectors who established if schools functioned according to set rules rather that supporting teaching staff. School inspection was considered a fault finding mission with punitive objectives; hence principals and teachers were negatively disposed to it. The Department of Basic Education since has re-interpreted intervention from checking compliance to support and development of school personnel. This task is allocated to units in district offices in provincial Departments of Education and district staff members' responsibilities are linked to responsibilities of principals and teachers.

The subject advisory unit focuses on curriculum matters in each school subject; thus Physical Science subject advisors support Physical Science teachers with content, pedagogical content knowledge, assessment and Interventions for improved results. This study investigated the role of Physical Science subject advisors in enhancing the quality of Physical Science teaching. Requirements for employment of a subject advisor (qualifications, work experience, interest, attitude and competence), challenges and solutions were explored by a mixed method study.

A Physical Science provincial DCES, Physical Science subject advisors, principals, Physical Science teachers in four districts and four PLC support groups were purposefully sampled to explore perceptions of the subject advisor's role in improving Physical Science teaching. Quantitative data collected by document analysis and questionnaires and qualitative data collected by individual and focus group interviews were analysed. Findings showed that the Physical Science subject advisors possessed minimum qualifications and experience; however, the school subject (Physics and Chemistry combined) does not match the specialization in tertiary institutions (divided into Physics and Chemistry). Thus, some subject advisors may major in one of two parts. Further, certain school content is not included in the university syllabus. This may limit advisors' content knowledge, the core of content support in Physical Science. This influences support offered to Physical Science teachers and requires advisors' professional development which is not currently offered by the Department of Basic Education. Recommendations based on the findings include immediate and long term solutions to improve effective subject advisory.

Keywords: Subject advisors, Physical Science, Mixed method study, Improvement of learner performance, teaching quality.

DECLARATION

I Magdeline Mmapaseka Stephen declare that: *The role of Physical Science subject advisors in enhancing the quality of the teaching of Physical Science in the FET phase (grade 10-12)* is my work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

__________________________ 31 January 2018

Magdeline Mmapaseka Stephen Date

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ACKNOWLEDGEMENT

I thank God for perfect health while I was conducting this study and the insight to write an acceptable thesis. It has been my desire to achieve this level of education since high school.

I thank my husband, Kisyeri Joseph Stephen – the love of my life – for inspiring me to further my studies and for supporting me by standing in for me with certain family responsibilities while I was studying. I would not have continued with this study if he did not persuade me.

I thank my supervisor, Professor A T Motlhabane, for offering the much needed insight required for this study, constructive feedback and encouragement to complete my study within the allocated time. My journey with him started with my Master's study and I don't know if my progress would have been equaled with any other supervisor.

I thank my colleagues and friends, who, after learning that I was pursuing this study, understood that I could not attend all the events that I was supposed to due to the demands of the study.

From the bottom of my heart, I thank, my son Keabetswe, and my daughter, Muniko Stephen, who are respectful and self-motivated and who are my inspiration. They are more than what I could ever hope for.

I thank Professor EM Lemmer for editing my study.

LIST OF ACCRONYMS AND ABBREVIATIONS USED IN THIS STUDY

ACE	Advanced certificate in Education
CAS	Curriculum Advisory Service
CAPS	Curriculum Assessment and Policy Statement
CDE	Centre for Development Enterprise
CIF	Curriculum Intervention forums
COSAS	Congress of South African students
CPD	Continuing Professional Development
DCES	Deputy Chief Education Specialist
DoBE	Department of Basic Education
DoE	Department of Education
DoHET	Department of Higher Education and Training
FET	Further Education and Training
GDE	Gauteng Department of Education
HEI	Higher Education Institutions
HoD	Head of Department
HRDC	Human Resource Development Council
IEB	Independent Examinations Board (IEB)
ITE	Initial Teacher Education
LTSM	Learning and Teaching Support Materials
MEC	Member of Executive Council
MST	Mathematics, Science and Technology

NCS	National Curriculum Statement
NEEDU	National Education Evaluation and Development Unit
NGO	Non-governmental organization
NOUN	National Open University of Nigeria
NSC	National Senior Certificate
NSES	National Science Education Standards
OSD	Occupation Specific dispensation
PDA	Professional Development Activities
PCK	Pedagogical Content Knowledge
PLC	Professional Learning Communities
QDA	Qualitative Data Analysis
REQV	Relative Education Qualification Value
SACE	South African Council of Educators
SACAI	South African Comprehensive Assessment Institutions
SAICA	South African Institute of Chartered Accountants
SBA	School Based Moderation
SMMA	Sequential Mixed Method Analysis
SWCMF	System Wide Curriculum Management Framework
TDP	Teacher Professional Development
TIMSS	Trends in International Mathematics and Science Study
UNESCO	United Nations Educational Scientific and Cultural Organizations

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CHAPTER 1

1.1 INTRODUCTION AND RATIONALE

District offices are the local hubs of provincial Education Departments and provide the vital lines of communication between the provincial head office and the education institutions in their care. They are central to the process of gathering information and diagnosing problems in schools, and they perform a vital support and intervention function (DoE, 2010-2013). A study conducted by Diko, Haupt and Molefe (2011) attributes curriculum support and implementation as responsibilities of education districts. International literature on school districts argues for the centrality of district support and capacity building in any school change process. District subject advisors have a professional duty to assist principals and teachers to improve the quality of teaching and learning in their institutions and to provide an enabling environment for the professional development of educators (DoE, 2011).

Support for teaching and learning is a universal practice and local education (district) offices including those in South Africa, are tasked to support schools with the view of enhancing learner outcomes (Roberts, 2012). It is no longer generic as in the past but relevant to different components of human resources at schools. Physical Science subject advisors are subject managers whose responsibilities are to provide the necessary content and pedagogical content support and development required for Physical Science teachers to produce quality results in their subjects. International and national literature concedes that on the importance of education districts in school support, there is a need for support of schools with the aim of improving the quality of education (Memduhoğlua, 2012). Furthermore, the quality of education and school effectiveness are attributed to the sound functioning of the assessment process like all other administration processes, which is brought by supervision.

A number of countries, particularly in Europe, establish government-funded agencies which are responsible to conduct school inspection and supervision. OFSTED and the

Dutch Inspectorate of Education are agencies founded for school inspection in the United Kingdom and the Netherlands respectively. In Europe government funded agencies are responsible to conduct school inspection and supervision which includes amongst other responsibilities; subject specialist visits (Inggris, 2012). In Kenya this responsibility is given to the quality assurance and standards officers (QASOs) (Mwinyipembe & Orodho, 2014). In countries such as Senegal, Guinea, Benin and Mali, for instance, district offices play the role of ensuring policy implementation. In these countries support to schools is done through inspection and mandatory advice to teachers. The education superintendent in Saudi Arabia cannot perform his/her duties in the development of education without the education supervisor's evaluation reports following visits to schools; therefore the development of education depends mainly on the education supervision office of the school district (Almannie, 2015).

Roberts (2012) argues that the core purpose of educational districts in South Africa is to support the delivery of the curriculum and to ensure that all learners are afforded good quality learning opportunities which are evidenced by learner achievement. This responsibility is assigned to district subject advisors. The officials also give pedagogical evaluation of the teachers' work as well as advice (Mavuso & Moyo, 2014). Roberts (2012) adds that this means that school and district leaders (subject advisors) should be well equipped with necessary skills to deliver their mandate in the interest of teaching and learning process at classroom level. While in theory inspection is expected to have a positive impact on academic performance, in practice, there are occasions when its impact is not easily noticeable and in some cases it impedes rather than improves academic performance.

This study investigated the role of Physical Science subject advisors in improving the quality of Physical Science teaching at schools.

1.2 BACKGROUND

1.2.1 What is subject advisory?

Subject advisory is a process of education supervision. The World Bank (2010) defines supervision as "the regular/periodic oversight of individuals or entities, which uses the results of evaluation (and sometimes inspection) to inform and direct action of those supervised." It has some overlap with evaluation and inspection, and often also with support, at least in the form of advice. It is formally defined as a relationship between senior and junior member of a profession that is evaluative, extends over time, serves to enhance the skills of the junior person, monitors the quality of the services offered by the junior person, and acts as gate keeping to the profession (Bernard & Goodyear, 2004). Ncube, Tshabalala, Muranda, and Mapolisa (2015) refer to education supervision as a process of working with teachers to improve their performance in their professional chores.

Wanzare (2002) concedes that education supervision is concerned with the improvement of standards and quality of education and should be an integral part of a school improvement program. Okendu, (2012) describes it as the process of enhancing the professional growth of the teachers, the curriculum and improving the techniques of teaching in the classroom through democratic interactions between the teacher and the supervisor. Education supervision requires a lot of planning, thereby requiring a partnership between subject advisors and teachers (Ololube, 2014) whereby the performance of (Physical Science) teachers' work can be monitored and where assistance, if required, can be provided. It encompasses a range of activities aimed at providing guidance and feedback to less experienced educationists from the perspective of a more experienced educationist.

Many countries throughout the world developed some means of monitoring the quality and standards of their education systems (Wanzare, 2002). The mechanism of inspection includes school visitation and/or desk-research evaluation on school, and/or school's self-evaluation and is the responsibility of inspectors or supervisors. Kithuka (2015) adds that inspection has dual roles – as a process of school improvement (supervisory and advisory) and a mechanism of accountability (auditory). On the one hand it is intended to help schools improve their performance (it is part of the school); on the other hand it is intended to control teachers and their operations (external auditor). The statutory goals of inspection and supervision are to control and stimulate the quality level of schools and public education (Inggris, 2012). The purpose of education supervision is the art and science of maintaining and improving teaching and learning (Harris, 2002).

Whitworth and Chiu (2015) stress the importance of understanding school and district leaders' views of professional development in their practices, and the factors that influence school and district leadership in choosing and designing professional development. Understanding these factors can provide insight into what types of professional development districts choose for teachers to experience. External supervision places emphasis on student outcomes, the quality of teaching and school leadership, student needs and the schools' abilities to diagnose and address their own strengths and weaknesses (World Bank, 2010). In Nigeria, in a response to critics on the quality of education and as a measure of improvement on the glaring downward trend on educational achievement, Sule (2013) opined that school supervision (internal or external) has become a veritable instrument for checking teachers' job performance.

During support and development of teachers, subject advisors use observation to provide positive feedback for teachers and strategies for continuing progress based on identifying their developmental needs. The strategies should be selected appropriately to meet the needs of teachers (UNESCO, 2007). Subject advisory is very important, facilitating the professional growth of a teacher, primarily by giving the teacher feedback about classroom interactions and helping the teacher make use of that feedback in order to make teaching more effective (Glatthorn, 2004).

1.2.2 Historical development of subject advisory

In the past, the roles of inspectors or supervisors were to check if teachers did the right thing and report to the higher offices. Over the years in Kenya, the role of QASOs was seen as that of an inspector whose work was to look for mistakes and recommend disciplinary action. They were seen as faultfinders who were mainly interested in reporting teachers to the Ministry of Education without giving teachers advice to enable them improve the teaching and learning techniques. Their visits to schools were impromptu and irregular. Such practice had adverse effects on teachers who felt mistrusted with their jobs and spied on. This goes for many countries in Africa and abroad (Mwinyipembe & Orodho, 2014). The district mandate has been variously characterized, as 'inspection', 'supervision', and more recently, 'support' (Mavuso, 2013). Other countries like Nigeria still use the term inspectors.

According to international study, external supervision by education districts is still referred to as inspection or supervision, and personnel responsible for this role are school supervisors or school inspectors. Quite often, the terms inspection and supervision have been used interchangeably in curriculum implementation. The major role of inspection as argued by Kithuka (2015) is to control while that of supervision is to guide. Current inspection trends call for openness on the part of inspectors. Internal and external supervision of teachers has its role in improving the quality of teaching. In Kenya the designation of inspectors was changed to quality assurance and standards officers, so that emphasis is rather placed on development and support (Mwinyipembe & Orodho, 2014).

The same situation was a concern in South Africa as well as most African and international countries. Principally, the school inspection system which is implemented in the Netherlands as well as Indonesia aims to promote school improvement as well as to control and enhance the educational quality (Inggris, 2012). Since the demand of teachers for guidance and support from supervisors has increased from time to time, some countries changed the terminology of curriculum supervisors and prefer the term ‘supervisor’ over that of ‘inspector’. Malawi uses “education methods advisor” and Uganda uses “teacher development advisor” (De Grawue & Carron, 2007). In South Africa the term has since been changed to subject advisory (Adendorff & Moodley, 2014).

1.2.3 Who are Physical Science subject advisors?

The understanding of how district leaders choose and implement professional development (either formal or ongoing) may also illuminate areas in which school and district leaders need professional development themselves. Education supervisors (subject advisors in the context of this study) play an important role in the development of education in a school district. The officers or officials performing the functions of monitoring/overseeing/supervising teachers and their teaching activities are called by various names/tags such as inspectors (Orenaiya, Adenowo, Aroyeun & Odusoga, 2014). They are assigned to oversee curriculum management but are also focused on improving the quality of education.

In South Africa a Physical Science subject advisor is a subject specialist who is based in a district office or circuit office and is tasked with facilitation of curriculum implementation, improvement of the teaching the environment as well as the process of learning. His/her duties include visiting schools, consulting with and advising school principals and teachers on curriculum matters (DoBE, 2013). They are part of a District Curriculum Support Team and their roles have one overriding purpose, which is to advance the implementation of Physical Science quality education and improved service delivery in all education institutions. Their appointment and responsibilities as stated in *The policy on organizational roles for districts (2012*) are consistent with the Occupation Specific Dispensation (OSD) (DoBE, 2013).

Subject advisors are curriculum leaders and managers (KZN strategy, 2012) whose major duties involve support for teachers with subject teaching and heads of department (HoD's) with subject management. For accountability, subject advisors should report progress and challenges to their line managers and ensure accountability from the subject heads at school level. The diagram below represents a management framework for reporting and accountability adapted from the System Wide Curriculum Management Framework (SWCMF**)** for Gauteng province (GDE, 2016).

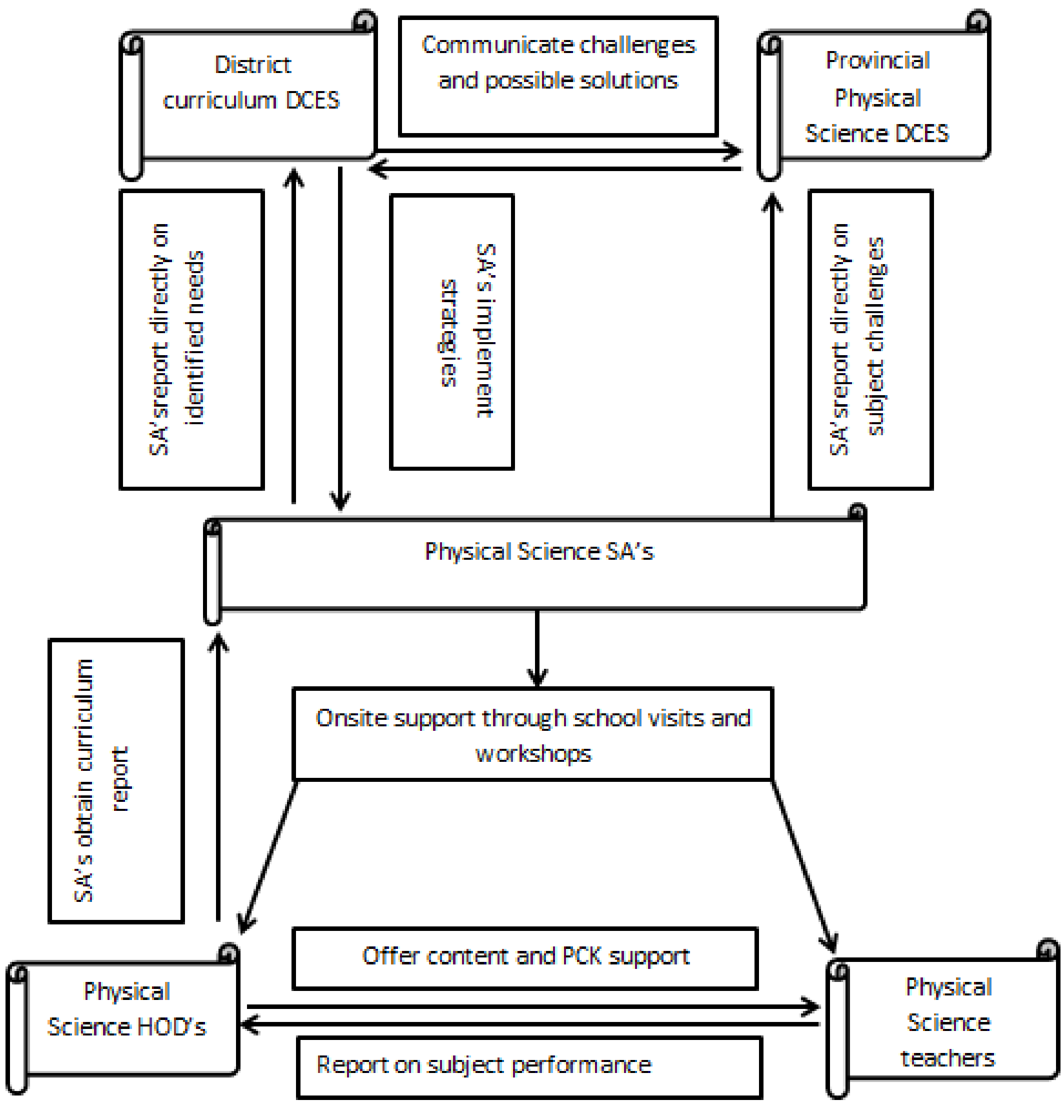

Fig 1.1: Subject advisors management framework for reporting and Accountability (adapted from the SWCMF for Gauteng Province)

1.3 THEORETICAL FRAMEWORK

The path goal theory and the facilitation theory were used as lenses for data collection in this study. The path goal theory is categorized under the contingency approach which concentrates its studies on the interaction between the variables involved in a leadership situation and patterns of leadership behaviour. The two intermediate theories under the path goal theory that were used were the goal setting theory and the expectancy theory. Goal-setting theory suggests that an effective way to motivate people is to set challenging but realistic goals and to offer rewards for goal accomplishment. The Expectancy theory explains why people work hard to attain work goals. People engage in behaviours that lead to goal attainment if they believe that goal attainment leads to something they value and that behaviours they engage in have a high chance (expectancy) of leading to the goal (Robin 2009).

The facilitative theory considers subject advisors as subject managers who should facilitate strategies for teaching and learning. Based on the support required at schools in improving the quality of Science education, this theory was chosen to establish how subject advisors as curriculum managers may best support teachers to attain expected quality results in this subject.

1.4 STATEMENT OF PURPOSE

Education reform over the years in South Africa has resulted in the need for a change in the management of education. Over the years, interventions by the provincial departments of education in schools were performed by school inspectors, whose roles were viewed by teachers and principals as policing and fault finding rather than correcting and offering support to schools, hence this intervention was not welcome. The implementation of a democratic government resulted in many changes including education management. Instead of supervision as it was previously done, education managers opted for support and development and this resulted in the decentralization of education offices into district offices within provinces. With this change came the inceptions of curriculum subject advisors, whose core roles are to support and develop teachers in their subject rather than fault finding. This study investigated the role of Physical Science subject advisors in improving the quality of Physical Science teaching.

This study was guided by the following objectives:

- To explore self-perceptions of practicing Physical Science subject advisors to establish if they perceive their role at schools as playing a significant role in improving the quality of Physical Science teaching.
- To establish whether the content and pedagogical content knowledge of subject advisors is sufficient for support and development of teachers in Physical Science teaching.
- To explore the curriculum delivery management and skills that Physical Science subject advisors have in enhancing the quality of the teaching of Physical Science in the FET phase (Grade 10-12).
- To establish from Physical Science subject advisors and teachers ways in which support and development given by subject advisors to Physical Science teachers can be improved or amended in order to increase the quality and quantity of Physical Science results.

In order to investigate the role of Physical Science subject advisors in improving the quality of the teaching of Physical Science in the FET phase (Grade 10-12), the study addressed the following primary question:

What roles are played by subject advisors in improving the quality of the teaching of Physical Science in the FET phase?

The following secondary questions assisted in answering the primary question:

- Do Physical Science subject advisors perceive their role at schools as playing a significant role in improving the quality of Physical Science teaching?
- Do the Physical Science subject advisors have sufficient Physical Science content and pedagogical content knowledge to assist teachers to improve the quality of the teaching of Physical Science in the FET phase (Grade 10-12)?
- What curriculum and management skills do Physical Science subject advisors possess to enhancing the quality of the teaching of Physical Science in the FET phase (Grade 10-12)?
- How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?

1.5 SIGNIFICANCE OF THE STUDY

The changing curriculum requires subject advisors to orientate new Physical Science teachers in Grade 10-11 on the CAPS and to continually mediate it to teachers who need support in implementing the curriculum. The orientation at once off subject meetings should be followed up by regular support and content development during school visits and through workshops. The role of subject advisors was not clearly defined some five years ago but with time, the department of education conducted research on the impact of subject advisors and discovered that some of the incompetency of subject advisors is due to undefined roles and unpreparedness of subject advisors to perform their job effectively.

The department of education mandated provincial education departments to offers training to Physical Science facilitators on content and pedagogical content knowledge based on the CAPS policy as well as refining roles of subject advisors in supporting and developing teachers. In spite of this, challenges prevail: some teachers feel that the support is insufficient and some subject advisors are frustrated with the poor impact of their support to schools. Implementation of clearly defined roles by subject advisors can positively influence the roles of teachers at schools and allow for a good chance to yield quality results.

Findings from the study provided recommendations to the department of education to:

- Review roles of Physical Science subject advisors and, where required, to align them predominantly to subject support if the impact of subject advisors as curriculum supporter is to be realized;
- Establish the competence of current Physical Science subject advisors in content knowledge and pedagogical content knowledge relevant for the current curriculum and to provide training if required;
- Re-emphasize to Physical Science teachers and principals the importance of external intervention in curriculum support and development by allowing subject advisors to support and develop teachers in content and pedagogical content knowledge as well as to hold teachers accountable for learner performance.

1.6 RESEARCH DESIGN

Several researchers have attempted to simplify the definition of a research design to assist with data collection. Burns (2003) describes a research design as a blueprint for conducting a study with maximum control over factors that may interfere with the trustworthiness of the findings. Denzin and Lincoln (2000) define it as a set of guidelines that connect theoretical paradigm to strategies of inquiry and to methods of collecting empirical material. It is also defined as the researcher’s plan of enquiry (Bogdan and Knopp Biklen, 2006; McMillan and Schumacher, 2001) that puts paradigms of interpretation into motion (Denzin and Lincoln, 2000) on how to proceed in gaining an understanding of a phenomenon in its natural setting (Ary, Jacobs & Razavieh, 2002).

Denzin and Lincoln (2000) indicate that the purpose of a research design is to provide valid and accurate answers possible for the research question. McMillan and Schumacher (2001) concede that an effective research design outlines the defined purpose in which there is coherence between the research questions and the methods or approaches proposed that generates data that is credible and verifiable. This study followed a mixed method approach. Mixed methods research refers to those studies or lines of inquiry that integrate one or more qualitative and quantitative techniques for data collection and/or analysis (Borkan, 2004). The integration of these methods can be done concurrently or sequentially and can either have equal weight or different weights.

The study also deals with education management thus the theoretical framework chosen was the path goal theory to assist in unpacking the management issues and the facilitation theory to assist in unpacking the content related issues. Collins, Onwuegbuzie, and Sutton (2006) conceptualize mixed research methods as comprising of 13 steps within three major stages. They are: research formulation stage (i.e., goal of the study, research objective, rationale for mixing, purpose of mixing, research question/s), research planning stage (i.e., sampling design, research design), and research implementation stage (i.e., data collection, data analysis, data validation/legitimation, data interpretation, report writing, reformulation of the research question). T

he mixed methods research design for this study was adapted from this method but comprised seven distinct steps which are: determining the research question; determining theoretical framework; selecting the mixed-method research design; data collection; data analysis; data validation; and conclusions and write the final report. Figure 1.2 below represents the research design for this study.

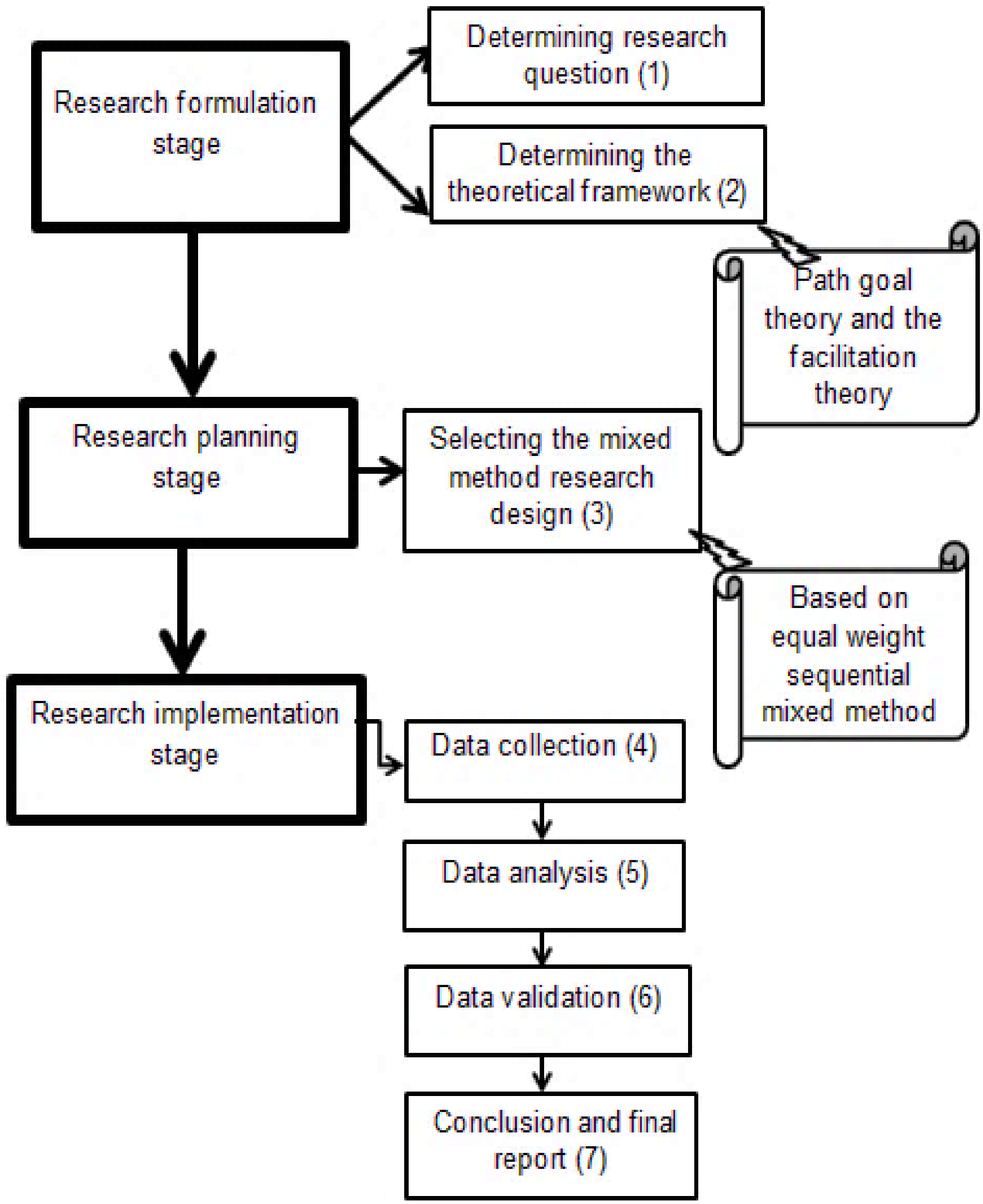

Figure 1.2: Research design

(adapted from: Collins, Onwuegbuzie & Sutton, 2006)

1.7 ETHICAL CONSIDERATIONS

Research, just like any other practice has ethical principles that need to be considered. The researcher has an obligation to respect the rights, needs, values and desires of the participants (Creswell, 2003). Silverman (2000) concedes that researchers should always remember that while they are doing their research, they are in actual fact entering the private spaces of their participants. Whenever research is conducted on people, their well-being should be top priority. Leedy and Ormrod (2005) indicate that ethical issues involve looking into the implication of focusing on human beings in the research or investigation and Smythe and Murray (2000) add that qualitative researchers should be generally explicit about their purposes for conducting research at the outset.

A researcher has responsibilities to his/her research participants, but also to his/her colleagues, and the people to whom he/she will present the research findings. A researcher needs to display honesty, integrity and respect as well as sensitivity towards participants (Punch, 2006). The study complied with standard ethical principles that govern the research process which are: Seeking and obtaining permission for data collection, obtaining informed consent from participants and allowing for voluntary withdrawal without threat, explaining the purpose of the study to the participants' prior data collection and ensuring confidentiality and anonymity of participants' responses.

1.8 CLARIFICATION OF CONCEPTS

In this section the key concepts used in the study are briefly defined.

Subject advisors

Subject advisors are office based educators in a district office or circuit office whose function is to facilitate curriculum implementation and improve the environment and process of learning and teaching by visiting schools, consulting with and advising principals and teachers on curriculum matters (DoBE, 2011c). Some administrative duties are also expected of them such as analysis of results with the aim of implementing relevant intervention strategies. This study focuses mainly on Physical Science subject advisors.

Physical Science

A subject that investigates the physical and chemical phenomena through scientific inquiry, application of scientific models, theories and laws in order to explain and predict events in the physical environment (DoBE, 2011a). At schools the subject starts from grade 10 to 12 as a continuation from lower classes. It is divided into Physics which has knowledge areas: Matter and materials; Waves, sound and light; Electricity and Magnetism and Mechanics plus Chemistry which consist of the following knowledge areas: Matter and Materials; Chemical change and Chemical systems (DoBE, 2011a).

Enhance

To enhance means to intensify, increase, and further improve the quality, value, extend of something (Oxford, 2008). This study established if Physical subject advisors are currently enhancing the quality of Physical Science as it is expected of them and to recommend ways in which this key role can be established.

Quality

Quality means the standard of something as measured against other things of a similar kind (Oxford, 2008). In South Africa the quality of Physical Sciences has been a concern for departments of education in different provinces, based on the performance of learners and the need for skills in Science to improve the economic status of this country, hence the choice of the subject for this study.

1.9 LIMITATIONS OF THE STUDY

It was anticipated that the study may be limited in the following ways: Firstly, the researcher is a subject advisor in the same province as participating subject advisors and thus, the provincial Deputy Chief Education Specialist (DCES) may not give fair information required for the study. She was concerned that subject advisors may feel threatened and not share accurate information. She was also concerned that teachers in the focus groups may hold back information out of fear that confidentiality would not be upheld particularly with regard to negative responses about subject advisors. The intervention of certain teacher unions in school related matters such as classroom observation by subject advisors was also challenge.

1.10 CHAPTER OUTLINE

This study comprises five chapters, outlined as follows:

Chapter 1

This chapter presents an introduction and rationale of the study, background and orientation of the problem, purpose of the study, theoretical framework, research design, ethical considerations, and limitations to the study and clarification of concepts.

Chapter 2

This chapter reviews the literature and the conceptual framework for this study on the roles of subject advisors in enhancing quality teaching. The theories used for this study are the path goal theory and the facilitation theory. The path goal theory explores the role of subject facilitators as subject managers/leaders and the facilitation theory focuses on the role of subject advisors as custodians of the curriculum.

Chapter 3

This chapter presents research design, research site, population, sampling methods, data collection procedures, data collection instruments as well as their justification in the research. Ethical considerations and limitations of the study are also presented.

Chapter 4

In this chapter, collected data were analysed and presented by simplifying data and drawing conclusions. The two theories guiding the study, the path goal theory and the facilitation theory, assisted in analysing data collected. A summary of all major findings on the roles of subject advisors in improving the quality of teaching Physical Science was done in this chapter. This is linked to the literature reviewed as well as the two theories chosen for this study.

Chapter 5

In this chapter conclusions were drawn and recommendations, implications for further studies presented.

1.11 CONCLUSION

Chapter one provided an overview and outline of development of the study. The next chapter presents a literature review of studies previously conducted, predominantly in South Africa but also international research on similar issues.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The literature review (McMillan and Schumacher, 2010) is a summary and analysis of the relevant literature about the research problem which illuminates the related literature to enable the reader to gain further insight from the study. The theoretical framework is provided which guides the literature and data for this study. Literature starts by exploring the problem with the learning of Physical by first discussing the status of the subject in South Africa and proceeds to the need for Physical Science subject advisory. The core function of subject advisors which is to act as curriculum managers and the challenges of education supervision are investigated as well as literature on what other studies view as effective subject advisory. The theoretical framework for this study incorporates aspects of this study but is also embedded in the literature studied.

2.2 THEORETICAL FRAMEWORK

A theoretical framework is a system of concepts, assumptions, expectations, beliefs and theories that support and inform a research (Maxwell, 2005). Merriam (2009) defines it as an underlying structure used to scaffold a study. She adds that it is the lens through which you view the world and it determines the researcher's curiosity by drawing upon the concepts, definitions, terms, models and theories of a particular literature base and disciplinary orientation. This generates the problem statement, research question, data collection, data analysis and data interpretation of a study. The path goal theory and the facilitation theory were used as lenses for data collection in this study. The diagram below illustrates how the two theories can be incorporated to successfully assist subject advisors to effectively support Physical Science teachers.

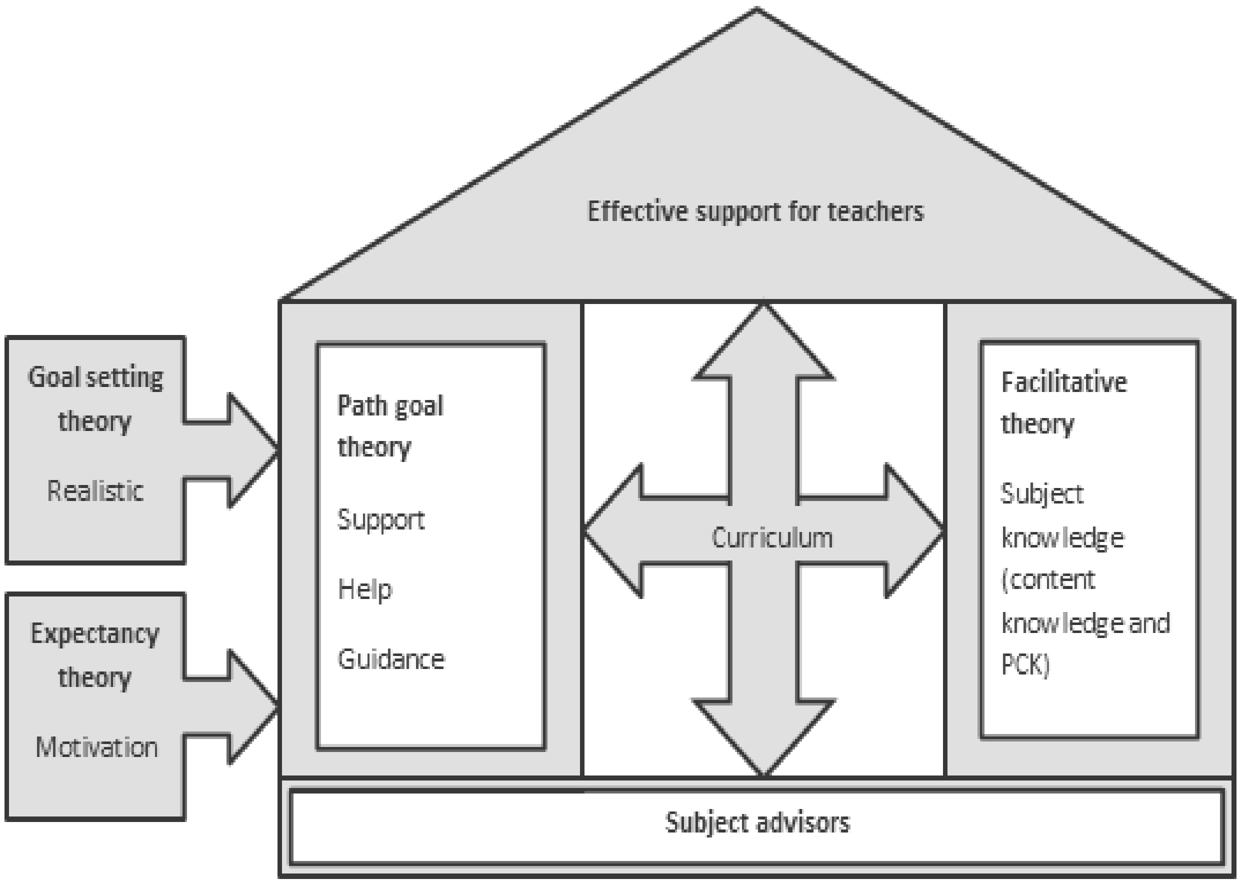

Figure 2.1: The theoretical framework

2.2.1 The Path Goal theory

This study utilizes the path goal theory which is categorized under the contingency approach and concentrates on the interaction between the variables involved in a leadership situation and patterns of leadership behaviour. The path goal theory was developed by Robert House in 1971 and revised in 1996 and is considered as the most effective contingency approach to leadership (House, 1971; House, 1996). This theory indicates that the leaders' main objective is to provide guidance, support, and help necessary for subordinates to achieve their own goals effectively besides the organization goals (Silverthorne, 2001). The contribution of the subordinates is possible with the existence of effective leadership which directs and guides the subordinates to the right way to achieve the organizational goals (Ratyan & Mohd, 2013).

In the context of this study the leader refers to the Physical Science subject advisor; subordinates refer to Physical Science teachers and the organizational goals are the goals set by the Department of Education to improve Physical Science performance. The path goal theory in this study was thought of as a process in which Physical Science subject advisors select specific behaviours that are best suited to teachers' needs and the working environment so that they may best guide them through their path of curriculum support and development in the achievement of their daily work activities to improve understanding of content knowledge and acceptable quality assessment practices for learners (Northouse, 2013).

The evolvement of education in the world and in South Africa has given education supervisors (subject advisors) a role of leaders who should assist in increasing the quality of teaching and student learning in schools (Kowalski & Brunner, 2005). This places the roles of subject advisors as subject manager for schools within a particular education district at a high structure, thereby requiring a high level of support. This theory assisted in establishing supportive leadership skills required from subject advisors to make their work acceptable and teachers more satisfied (Ratyan & Mohn, 2013). The two intermediate theories under the path goal theory that were used are the goal setting theory and the expectancy theory.

2.2.1.1 Goal setting theory

Goal setting theory suggests that an effective way to motivate people is to set challenging but realistic goals and to offer rewards for goal accomplishment. The goals for each school is to produce satisfactory Physical Science results through quality teaching without ignoring contextual factors for each school; therefore support is not generic but depends on teachers’ needs. Educational supervision is based on principles which guarantee purposefulness and dynamism in an educational system (Jahanian &

Ebrahimi, 2013). Goals that Physical Science subject advisors set, which are based on the departmental roles, should prepare the teachers to start their activities through planning, teaching and assessment activities and to continue and accomplish them by fully observing respective principles of increased quality teaching by implementing possible provincial and district improvement strategies for Physical Science and complying with relevant education policy documents. Effective teaching and learning practices should be identified, modeled and supported (DoBE, 2011b).

To attain desired goals, subject advisors should formulate a definite plan for supervising classes of teachers and should focus attention on the teaching situation and not on the teacher as a person (Obiweluozor, Momoh & Ogbonnaya, 2013). Niknami (2011) emphasizes that educational supervision must explain and indicate educational goals. The educational goals and their importance must always be pointed out to teachers and be regarded as a base for work and activity of educational guides and teachers. Setting of goals requires a lot of preparation by subject advisors to ensure that emphasis is placed on the professional growth of teachers by developing their power of self-direction and giving them freedom to try out new experiments, methods and innovation in the process of teaching. Supervision is an organizational obligation for determining the level of achieving organizational goals. Therefore, subject advisors should determine the effectiveness of school activities and whether or not there are any divergences from the aims of the educational system (Bursalioglu, 2003).

2.2.1.2 The expectancy theory

Expectancy theory explains why people work hard to attain work goals. People engage in behaviours that lead to goal attainment if they believe that goal attainment leads to something they value and that behaviours they engage in have a high chance (expectancy) of leading to the goal (Robin, 2009). Physical Science subject advisors are expected to improve teaching quality of Physical Science teachers which will improve learner performance. Supervision is necessary for an increase in educational quality, sustainability of educational worker development, the determination and elimination of possible deficiencies, keeping up with developments in the educational system and collaborating within the school (Ozdemir & Yirci, 2015). Physical Science education supervision should be aimed at developing teachers, thereby making them to be receptive to subject advisors.

Glickman, Gordon and Ross-Gordon (2005) define developmental supervision as application of “certain knowledge, interpersonal skills and technical skills to the tasks of direct assistance, group development, curriculum development, professional development, and action research that will enable teachers to teach in a collective, purposeful manner uniting organizational goals and teacher needs and provide for improved student learning." This view of supervision represents a paradigm shift from mere inspection of people as subordinates to encouraging collegial interactions which explain why the job description of subject advisors in South Africa is based on support and development rather that fault finding. Physical Science subject advisors are tasked with the responsibility to provide support for teachers within a particular district office on subject related issues. Effective support requires the subject advisor to determine the teachers’ environmental characteristics: the school where they are working, the conditions under which they are working and accessible information at their disposal.

2.2.1.3 Leadership styles in the path goal theory

The path goal theory was considered for this study on the basis that it includes two situational contingencies: the group member’s personal characteristics which are highly required for the management of teachers; and the environment of work which is the school and the classroom where teachers carry out their duties (Daft & Lane, 2005). Four different types of leadership styles are suggested by the path goal theory: participative, supportive, directive, and achievement-oriented leadership styles (Robin, 2012). The four leadership styles are based on three attitudes exhibited by subordinates, which are: subordinates’ satisfaction, subordinates’ expectations of their leaders, and subordinates’ expectations of effective performance (Negron, 2008). Subject advisors should know which style to practice and when (Rad &

Yarmohammadian, 2006). Due to the diverse nature of the schools and teachers, the contingency theory denies the existence of a single leadership pattern for all cases (Ratyan & Mohd, 2013). The kind of support and the teachers' needs inform the leadership style that subject advisors should choose (Robin, 2012).

(i) The participative leadership style

The participative leader shares responsibilities with subordinates by involving them in the planning, decision-making, and execution phases (Negron, 2008). Participative leadership is appropriate when subordinates show a lack of judgment or when procedures have not been followed (Negrn, 2008). There is always a change of Physical Science teachers and it is observed that some exhibit poor judgment and unacceptable teaching methods of the Physical Science curriculum. This is due to changing places of work (schools), rotation between grades within a school, retiring and resuming teachers and intake of new teachers. As a result it is imperative for Physical Science subject advisors to consult with teachers and take their ideas into account when making decisions and taking particular actions so that more knowledgeable and more experienced teachers can share expertise with less knowledgeable and less experienced teachers.

Physical Science teachers are faced with learners who are different from others and the school context varies in different schools. It then becomes important that the support provided does not become uniform for all schools within a particular education district. Support should be structured in accordance to the unique challenges of teachers and schools. Subject advisors need to accept teachers' professional judgments concerning what is best for student learning in order for supervisory assistance of this nature to be seen as non-judgmental (Treslan, 2005). Subject meetings, workshops and professional learning communities (PLC) which subject advisors coordinate present an opportunity for participation by Physical Science teachers. Subject advisory is not a one man show and requires the input of both the subject advisor and the teacher (supervisee) for effective implementation of the Physical Science curriculum.

(ii) Supportive leadership style

Supportive leadership involves being considerate to the needs of subordinates and creating a friendly atmosphere to work in. It increases subordinates' satisfaction and self-confidence and reduces the negative aspects of the situation. This should lead to an increase in the intrinsic valance of the job and the expectation that it will be performed well and lead to the attainment of goals (Robin, 2012). The path goal theory introduces a practical model that confirms and illustrates the leaders' important ways to help the subordinates (Northhouse, 2010). Support for curriculum by subject advisors is stated in the *policy on organizational roles for a South African district office* (DoBE, 2011c & DoBE, 2013). The supportive style considers the needs of the follower (Physical Science teachers), showing concern for their welfare and creating a friendly working environment thereby increasing their self-esteem and making the job more interesting.

A supportive leader motivates the subordinate by decreasing negative aspects of the work environment. For Physical Science teachers, improved quality teaching and assessment practices not only increases their interest in the subject but those of learners as well and consequently their performance in the subject. Subject advisors need to create a feeling of satisfaction among teachers by showing interest in them as people. It is assumed that a satisfied teacher would work harder and would be easier to work with (Sergiovanni & Starrratt, 2007). The supportive approach is best when the work is stressful, boring or hazardous. The evolvement of education has created a leadership role for education supervisors (subject advisors) aimed at increasing the quality of teaching and student learning in schools (Kowalski & Brunner, 2005).

Teachers know better about their strengths and weaknesses whilst the subject advisor is simply there as a facilitator for supporting the teacher to achieve better performance.

For that reason, teachers need to participate in the evaluation process, so school inspection methods and its objectives should make teachers feel that they are important and useful to a particular school (Matete, 2009). By understanding how teachers grow most advantageous in a supportive and challenging environment, the supervisor can plan the tasks of supervision to bring together organizational goals and teacher needs into a single fluid entity. The unification of individual teacher needs with organizational goals helps to promote powerful instruction and improved student learning (Tesema, 2014).

(iii) The directive leadership style

Directive leadership involves letting subordinates know what is expected of them, giving clear guidelines, and making sure they know the rules and procedures to get the work done (Robin, 2012). Physical Science subject advisors will not achieve their goal of improving the quality of the teaching the subject if teachers are not sure of what is expected of them. The provincial departments of education in South Africa provide work schedules, programs of assessment and school based assessment tasks that subject advisors use to monitor and guide teachers who have challenges. These are covered in what was previously known as the scheme of work. Ololube (2013) defines a scheme of work as a guideline that defines the structure and content of a subject.

It shows how resources such as books and equipment are to be used and how class time, class activities and class assessments are to be carried out to ensure that the learning aims and objectives of the subject are met. A scheme of work can be shared with students so that they have an overview of their subjects. It becomes imperative for subject advisors to monitor correct implementation of the work schedule to ensure that learners receive the education they deserve. Direct training by subject area experts in disciplinary content and pedagogy, curriculum topics, instructional techniques, in-class training, support and observations involving senior teachers, professional learning communities and assistance materials development is requested by teachers from subject advisors (Department of Higher Education and Training {DoHET}, 2011).

This increases the teachers' sense of security and control and hence is appropriate to the situation. During school visits teachers' progress is monitored in accordance with these documents.

(iv) Achievement-oriented leadership styles

Achievement-oriented leadership involves setting challenging work goals, emphasizing the need for excellence in performance, and showing confidence that the subordinates will attain high work standards (Robin, 2012). In South African provinces, subject advisors are provided with subject targets at the beginning of each year, which should be shared with teachers and strategies formulated to try and meet the targets. An achievement oriented style is effective when the work is complex and the environment is uncertain. The poor performance of Physical Science and several challenges with underperforming teachers make support for Physical Science challenging.

2.2.2 The facilitation theory

The facilitation theory, also called facilitative teaching, is a humanist approach to learning, developed during 1980s by Carl Rogers and other contributors (Roger, 1967). The study adapted this theory based on assumptions that subject advisors are the key players in the process of guiding teaching and checking if the curriculum policy is followed to the core in order to impact content quality. Learning (curriculum support) occurs though facilitation by establishing an atmosphere in which teachers feel comfortable to consider new ideas and are not threatened by external factors. Dunn (2000) considers that human beings have a natural eagerness to learn, so Physical Science teachers are eager to increase content knowledge and pedagogical content knowledge provided by Physical Science subject advisors.

Curriculum support implies that subject advisors are subject specialists whose core role is curriculum support in their subject of specialty. Their role predominantly entails to support teaching practice and assessment of learners (DoBE, 2013) by establishing close contact with the teachers, getting to know them and offering them empathy. This support requires a great amount of effort from subject advisors. With regard to curriculum implementation, Marsh (2002) views district officials as implementers of state policies. Stein and D'Amico (2002) views them as professional learning laboratories, while Grossman, Thompson and Valencia (2002) view them as teacher educators for beginning teachers who struggle with the daily decisions about what and how to teach.

The Strategic Planning 2011-2025 states that addressing teachers' development needs is fundamental to improving the quality of teaching and learning in South Africa, and adds that effective teaching and learning practices should be identified, modeled and supported (DoBE, 2011b). Direct training by subject advisors in disciplinary content and pedagogy, curriculum topics, instructional techniques, in-class training, support and observations involving senior teachers, professional learning communities and assistance with materials development is important for curriculum support (DoHET, 2011). Teachers are identified as individuals who have to develop professionally because they need the support of colleagues whose professional development is greater. Supervision of instruction through support and development is required to guide teachers to be able to combine relevant input for enhancement of the teaching and learning process.

The success of an educational program depends especially on the achievement of effective learning which in turn depends largely on the job performance of the teachers (Oyewole & Ehinola, 2014). Rogers suggests three attitudinal qualities necessary for facilitative practice in education. These so-called *core conditions* are discussed in (i), (ii) and (iii) below.

2.2.2.1 Attitudinal qualities of the facilitative theory

(i) Realness

Realness means that subject advisors should be aware of their feelings and able to communicate them appropriately. Roger (1969) discourages leaders to be the only ones possessing information to convey to followers but suggests that they should rather encourage attitudes of respect, warmth, caring, liking and understanding. Subject advisors, as advised by Roger (1969), must not pretend to be all-knowing and perfect, since the teachers know that cannot be the truth. Their roles in the development and support of teachers should be to explain educational supervision and guidance as an exchange of knowledge and skills in practice between a skilled individual and a trainee and from a skilled individual to an inexperienced individual (Jahanian & Ebrahimi, 2013). Subject advisors should therefore see their role as imparting knowledge to teachers and gaining knowledge from teachers.

(ii) Prizing, acceptance and trust

Prizing, acceptance and trust involve caring about the teachers and accepting their feelings. Subject advisors should not value teachers for their positive or negative characteristics, but because they are all valuable human beings. Prizing can be demonstrated by subject advisors when they listen to what teachers are saying without criticism but to learn from their ideas**,** thoughts and feelings so that teachers can feel free to explain their thoughts. It can also be manifested through responding to what the teachers say (Rogers, 1969). Trust, cooperation and positive communication between subject advisors and teachers can lead to effective supervision (Can, 2004). Supervision is cooperation among individuals and is interactive instead of being direct, people-oriented instead of authoritarian and teacher-orientated instead of supervisor-orientated (Jahanian & Ebrahimi, 2013).

(iii) Empathy

Empathy means being able to *walk in another's shoes*. This means that a subject advisor can understand the teachers' perspective on the process on learning and their reactions from the inside. The accent here is to understand, not judge *or* evaluate. Empathy enables the subject advisor to understand the reasons that lead the teachers to certain behavior, but also to understand their emotional situation that needs to be solved in order to enable significant learning. In agreement to Roger (1969), subject advisors should not do all work during the educational process but should involve teachers as well. In order to contribute to their own learning, teachers should be aware of the facilitative conditions implemented for their benefit, be aware that the problem to be learned is realistic, relevant and meaningful and motivated**,** since motivation is a tendency towards self-actualization present in all healthy individuals (Rogers, 1969).

Ozdemir and Yirci (2015) indicate that positive communication with teachers without prejudgment is crucial for effective supervision. Attitudinal qualities can only be implemented through documents that guide the procedure to be followed by subject advisors for effective curriculum support, such as the District Standard Routine and Operation Guidelines of 2017 (DoBE, 2017a). This document was developed to guide district officials across the country to ensure that all activities in their respective districts are focused and directed at supporting the delivery of curriculum and overall improvement of learning outcomes. Subject advisors' roles are influenced by standards set in document such as this.

2.3 TEACHING AND LEARNING OF PHYSICAL SCIENCE IN SOUTH AFRICA

There are several factors that have affected the teaching and learning of Physical Sciences. These factors are result of the historical curriculum of Physical Science for the type of education that was offered to different races in South Africa as well as the current education changes post the democratic election. Although these challenges are looked at separately, they are interrelated since they have affected all levels of curriculum management and support of Physical Science from the provincial departments of education to the district offices and to schools. Those that were explored to assist in investigating the roles of Physical Science subject advisors in improving the quality of teaching Physical Science teaching were: the types of schools in South Africa; the Physical Science school curriculum, the performance of learners in Physical Science and the quality of a Physical Science teacher

2.3.1 Types of schools in South Africa

South Africa has a wide range of schools, learners, teachers and different curriculum. These differences contribute to the difference in the quality of education received by learners especially in key subjects like Physical Science. There are two types of basic education institution in South Africa, the public schools and independent. Public schools are those that are regulated and funded by the department of basic education. South African schools have primary schools which start with grade R to grade 7 and secondary schools which start with grade 8 to 12. Within the secondary school level, there is the FET phase which caters from grade 10 to 12. It is at this level that learners start choosing subjects of specialization and a level at which Physical Science (a combination of Physics and Chemistry) is learned.

Public schools and certain independent schools write a grade 12 (matric) external examination regulated by the department of basic education whereas independent schools that are not affiliated with department of basic education write examination regulated by independent assessment boards such as the South African Comprehensive Assessment Institutions (SACAI), Independent Examinations Board (IEB) etc. The majority of South African Physical Science learners are located in the historically disadvantaged school system, which still serves mainly black and coloured children. These schools use English as a language of instructions except in some coloured communities where Afrikaans would be the language of instruction. Physical Science teachers from these institutions are predominantly those that received an education degree or diploma which was not of the same quality as that of “whites” teacher education before the democratic dispensation in 1994.

Other public schools are referred to as former model C schools which were historically “whites only” schools taught by predominantly white teachers from institutions that offered a more superior Physical Science education curriculum as compared to those for black teachers’ prior 1994. These schools are located in suburbs. The former mode C schools differ with the language of instruction in that some use English as the language of instructions, some use Afrikaans only and some use both. These differences in types of schools and the quality of teacher education have resulted in differences in the quality of learning and teaching because of the background of the communities that utilize these schools (Fleisch, 2008, Van der Berg, 2008, Taylor and Yu, 2009).

2.3.2 The South African school curriculum

In South Africa a single document is utilized for implementation of curriculum in all South African schools. The South African Curriculum, Assessment and Policy Statement (CAPS) represent an amendment to the National Curriculum Statement (NCS) Grades R-12, so that the curriculum is more accessible to teachers. The aim is that every subject in each grade will have a single, comprehensive and concise curriculum that will provide details on what content teachers ought to teach and assess on a grade-by-grade and subject–by-subject basis. The CAPS was implemented in response to an educational system that undermined the intellectual capacity of black learners and exacerbated inequality in student educational outcomes. It was introduced to alleviate demarcations in education that were observable prior democratic school system which failed most students of colour. The Physical Science curriculum as stated in the CAPS policy document comprises of Physics and Chemistry content (DoBE, 2011a).

2.3.3 The performance of Physical Science learners

The vexing problem in South African schools has been the observation that, in spite of relatively larger investments made into education compared to neighbouring countries, increased inputs do not seem to match the observed learning outcomes (Chisholm & Wildeman, 2013). Both regional and international benchmarking studies continue to show that the level and quality of (Science) learning outcomes in South Africa's schools tend to be lower than those of countries that invest significantly less in their schooling sectors (Moloi & Chetty, 2010). According to Kanjee and Sayed (2013), most state schools in South Africa are underperforming. Van der Berg, Taylor, Gustafsson, Spaul and Armstrong (2011) identify such leaners as those from historically disadvantaged system, which still serves mainly black and coloured children.

With regards to the learning of Physical Science, Asmal and James, (2001) still attributed the low performance of learners in historically disadvantaged schools to ‘Bantu Education’, which provided limited instruction in Science and was instituted to direct non-white people into the unskilled workforce. However, even past post-apartheid, historically disadvantaged learners have not shown a significant improvement in academic performance (Van der Berg & Louw, 2008). The present challenge facing school Science in South Africa is the poor learner performance in especially historically disadvantaged schools (Koopman, 2013). Research conducted in 2017 on South African Science performance revealed that learners exhibited limited skills, or lacked necessary skills required to produce promising Science results (James, Naidoo & Benson, 2008). The status quo on the learner performance in Science had not changed in 2015 (Naidoo & Paideya, 2015).

South Africa was ranked yet again the lowest amongst 50 countries in the Trends in International Mathematics and Science Study (TIMSS) undertaken in 2003 (Letseka, Bantwini & King-McKenzie, 2012). The recent Global Information Technology Report ranked the quality of the South African educational system as 146 out of 148 countries.

The South African National pass rate in Physical Science was 67,4% in 2013, 61,5% in 2014, 58,6% in 2015; 62% in 2016 and 65,1% in 2017. The province that performed the highest in Physical Science in 2017 in South Africa obtained 77% (DoBE, 2017c). The overall Physical Science pass percentage in the sampled province was 75,6 in 2013, 68,3 in 2014, 67,7 in 2015, 68, 5%; in 2016 and 70, 2% and in 2017 with only one district obtaining a pass percentage of above 80% for the first time in the past five years (DoBE, 2017c). The national pass percentage has never exceeded 70% in the past five years and the pass percentage of the sampled province has never reached 80%.

How well learners in a country perform in Science is a predictor of economic growth, as it points to the quality of the human capital pool (Siyepu, 2013; Vorderman, Porkess, Budd, Dunne & Rahman-Hart, 2011). Good grade 12 results in Physical Science open doors for learners to careers such as engineering, medicine, biotechnology and astronomy. The fundamentals of a socially just Science education must encompass access to the curriculum, resources, good teachers, and favourable conditions for learning (Gates & Jorgensen, 2009).

2.3.4 The quality of Physical Science teachers

Teachers are at the heart of curriculum delivery. Teacher quality is an important factor in determining gains in student achievement, even after accounting for prior student learning and family background characteristics. Predictors of teacher quality have typically included factors such as class size, certification, type of qualification, degrees earned, or years of experience (Guerriero, 2016). The success and quality of any education system depend on the quality of teachers input into the system (Dangara, 2015). The primary purpose of education is teaching and learning which is about imparting and creating knowledge, skills, concepts, processes, values and attitudes necessary for learners to satisfactorily achieve the learning objectives (KZN strategy

2012). The purpose of Physical Sciences is to equip learners with investigating skills relating to physical and chemical phenomena (DoBE, 2011a).

Every education system at every level depends heavily on teachers for the execution of its programs, the quality of instruction and student performance (Alimi & Akinfolarin, 2012). The quality of education compared to the quality of teachers education obtained by Physical Science teachers in most public rural and township schools in South Africa do not correlate. Bernstein and Hofmeyr (2015) attributes teachers' lack of essential knowledge and skills to inadequate pre service teacher training provided through Initial Teacher Education (ITE) programs at Higher Education Institutions (HEIs). In the apartheid era, quality of teacher education for Africans was deliberately inferior to that for Whites.

These structural inequalities made sure that high quality Science education was not provided for the majority of Black, Coloured and Indian learners (Kahn, 2006). The contradictions in the type of teachers education obtained prior the democracy and the current demand of the CAPS curriculum for most Physical Science teacher in South Africa confirm Barber and Mourshed (2007) findings that the quality of an education system cannot exceed the quality of its teachers The broad consensus is that 'teacher quality' is the single most important school variable influencing pupil achievement (Spaull, 2013). Science education forms a core part of critical citizenship empowerment therefore Science teaching has a significant role in positioning learners for success or failure as learners and citizens (Ndlovu, 2011).

The teaching and learning of Science at Schools in South Africa aimed at learner's full participation in democratic processes and unrestricted career choice and advancement within society requires learners to be able to understand and apply complex and abstract Science ideas (Naidoo, 2012). Teachers' misconceptions in the teaching of Physical Science may often be transferred to their students (Bayraktar, 2009). Effective education of Physics teachers must be based on sound research and led by specialists in Physics education (Meltzera, 2013). Teachers are tasked with the responsibility of addressing learners' challenges associated with the learning of Physical Science.

2.4 EXPECTED QUALITIES OF PHYSICAL SCIENCE SUBJECT ADVISORS

Effective curriculum support requires the display of certain qualities. The Physical Science subject advisor’s role is based on supervision of instruction with prospects of bringing about improvement in the teaching-learning process through a network of cooperative activities and democratic relationship of persons concerned with teaching and learning (Oyewole & Ehinola, 2014). Democratic relations means that professional and personal qualities are key factors in the appointment of subject advisors (Baxter, 2013) and contribute to the way subject advisors make their judgments during curriculum support while also influencing their abilities to convey these judgments both orally and in writing. The two qualities are interrelated and play a significant role to effective execution of duties by subject advisors. They both have an impact on the competence of the subject advisor which has the potential to cascade to the competence of a teacher and ultimately to that of a learner.

2.4.1 Professional qualities

Baxter (2013) indicates that to feel professionally salient or effective in any field requires a strong professional identity. The Human Resource Development Council (HRDC) report of 2014 stated the following as professional qualities of subject advisors:

- Competent and confident in delivering support to educators in his/her particular subject area(s);
- A specialist in his/her area(s) of expertise (with a minimum of 3 years senior management experience);
- Able to facilitate the growth of educators and support them in developing their subject content knowledge;

- An expert able to lead from the front and develop educators effectively;
- A catalyst for excellence in teaching and learning;
- An individual who manages resources well and delivers specific training to his/her constituents on a regular basis and in an integrated manner.

Professional qualities stated in the 2014 HRDC report which relate to qualifications and experience, subject knowledge (content and pedagogical content knowledge), and competence are considered for this study based on their relevance in curriculum support.

2.4.1.1 Qualifications and experience

Qualifications and experience in a subject area play a major role in considering one for a position of a subject advisor as mentioned by Wilcox (2000). Lack of proper qualifications and sufficient experience may create doubt in teachers on the quality of support required. Okoro (2004) concedes that supervisors with higher educational qualifications are likely to perform better due to the experience they have acquired from schools, display more confidence in their workplace and are also more accessible to current information than their counterparts with lower qualifications who are usually not exposed to the modern changes. Educational level and experience of subject advisors improve teachers' trust towards them provided they also set a good example in work performance.

Milondzo and Malatji (2015) recommend that educational managers should be more experienced in order to assist the school principals and Heads of Departments to implement the strategic plan and improve learner performance. Although it cannot be said that subject advisors know more than teachers, teachers appreciate it if they receive subject support from a person who possesses valid qualifications, meets professional requirements and have worked as teachers before becoming school inspectors (Matete, 2009). Subject advisors should keep on increasing their subject knowledge to match the changing curriculum reforms and modernized teaching methods. Ehren and Visscher (2006) recommend that they advance themselves academically and possess a wider knowledge base and skills to facilitate their work.

Teachers with fewer years of experience in the school system need the guidance of experienced more knowledgeable subject advisors. This is very helpful to develop the skills and capabilities that are required to guide the learning process (Madziyire, 2010). Physical Science subject specialization cannot be overlooked for Physical Science subject advisors because they require content and pedagogical content knowledge to fulfill their role. For example, in Tanzania inspectors for secondary schools specialize in a certain subject and must have at least eight years of teaching experience in secondary schools (Kambuga & Dadi, 2015).

Other countries require higher education qualifications to be able to support a subject, for example in Saudi Arabia the main selection criteria for education supervisors are a B.Sc. degree in education with a minimum of a "C" average, have working experience in teaching for at least four years, have an evaluation of "excellent" or higher in teaching for the last four years and have the ability to communicate, influence others and follow new innovations in the relevant field (Almannie, 2015). The requirements for a Physical Science subject advisor in South Africa, is Grade 12 plus four years' tertiary qualification (M+ 4), REQV 15 /an equivalent qualification in Physical Science, registration with the South African Council of Educators (SACE) and a minimum of six years' experience in the education field (DoBE, 2011b). A previous management position at school as the HoD is an advantage, the ability to exercise authority well and the advisor's delegated powers must afford him/her sufficient discretion to make decisions (DoBE, 2012).

2.4.1.2 Subject knowledge (content and pedagogical content knowledge)

The professional standing of subject advisors links with the knowledge base required to fulfill their role (Villegas-Reimers 2003), which implies subject mastery whilst pedagogical content knowledge relates to effective methodologies. Monitoring and advising on standards in education and training requires professionalism through subject mastery (Oyaya, 2007). The 2012 Gauteng Department of Education presentation on roles and responsibilities of subject advisors describes the position of a subject advisor as a specialist post that requires the incumbent to be a subject specialist in his/her field, demonstrating both depth of content knowledge as well as its pedagogy. Teachers are identified as individuals who have to develop professionally because they need the support of colleagues whose professional development is greater (Oyewole & Ehinola, 2014).

In order to offer effective subject advisory to teachers, subject advisors should have a very good grasp of their specialization subjects and use this knowledge to assist teachers as well as plan for intervention where required. A broad knowledge base and a sound grasp of how the school is performing in Physical Science in supporting and developing teachers is imperative for subject advisors, as inadequate knowledge may compromise the quality of support. Conceptualizing teacher knowledge is a complex issue that involves understanding key underlying phenomena such as the process of teaching and learning, the concept of knowledge, as well as the way teachers' knowledge is put into action in the classroom (Guerriero, 2016). This might facilitate the process whereby advice and recommendations from subject advisors may be accepted by teachers who will be willing to implement them (Ehren & Visscher, 2006).

Subject knowledge assists subject advisors to deliver effective workshops and meetings because if they approach teachers with insight and understanding, training becomes a process of communication instead of a process of imparting information (Koopman, 2013). In so doing, they are able to break down those layers and complexes that stir up emotions which cause teachers to reject new ideas presented to them during the training. Treslan (2005) adds that effective assistance to teachers require those in supervisory positions to have extensive knowledge in the areas of collaborative effort, the learning process, and phases of developmental supervision.

2.4.1.3 Competence

The 2014 HRDC report indicates that although in South Africa there is a complement of qualified and experienced district officials, it is not entirely clear how competent and committed they are. The competence of subject advisor was a concern cited by Afolabi and Loto (2008). They found that the emphasis in supervision of education should be on the improvement of instruction where the supervisor is regarded as an adviser whose experience is such that he/she can offer positive assistance to the average teacher. Effective leaders exercise an indirect but powerful influence on the effectiveness of the school and on the achievement of learners (Harris, Day, Hopkins, Hadfield, Hargreaves & Chapman, 2003).

Ozdemir and Yirci (2015) emphasize that the agents who carry out the supervision (subject advisors) should have professional competencies, should be able to enter into effective communication, should be able to spare enough time for supervision and follow the principles of equality. In addition, the importance of effective and sufficient guidance was highlighted. Competence implies that supervisors need to possess certain skills to carry out their work effectively. Glickman, Gordon and Ross-Gordon, (2005) explain these skills as follows:

1. **Knowledge skills base:** supervisors need to understand what teachers and schools can be and what teachers and schools are. For Physical Science the knowledge about teachers includes their qualification, their strength in teaching Physical Science (topics that they can teach well and those in which they encounter challenges), teachers' experience per grade and personal issues about teachers that can affect their teaching practice. The knowledge obtained forms a basis for development and support of teachers either for a group of teachers with similar problems or for individual teachers.

2. **Technical skills:** Science technical skills are the knowledge and abilities needed to accomplish scientific duties. Physical Science is a practical subject which

requires experimentation and the use of ICT to enhance learner understanding. Supervisors must have technical skills in observing, planning, assessing and evaluating instructional improvement in order to help teachers improve Science teaching. Supervisors have certain educational tasks at their disposal that enable teachers to evaluate and modify their instruction.

2.4.2 Personal qualities

Education supervision is underpinned by several key principles including active listening, mentoring, creating a supportive learning environment, providing constructive feedback, encouraging reflective practice and developing insightful or self-aware approaches in teachers (Ekundayo, Oyerinde & Kolawole, 2013). Upgrading teachers' skills requires a good rapport by using a collegial approach and respect of individual differences (Oyaya, 2007). Subject advisors should demonstrate secure judgments which are reliable, valid, comprehensive, prognostic and corporate hence their judgments have to be impartial. The establishment of a congenial relationship with those to be observed is a basic step, as observation must be built on a foundation of trust during classroom observation (Lasagabaster & Sierra, 2011).

Subject advisors should manifest acceptable personal qualities mentioned by MacBeath, (2006) such as, behaving in an open, honest and fair manner during the supervision process. An atmosphere of positive communication is necessary for effective supervision (Obiweluozor, Momoh & Ogbonnaya, 2013), which should be constructive and positive throughout the supervision process (Ozdemir & Yirci, 2015). According to Stadan (2000), a good school-based supervisor should be approachable, a good listener, very patient and a strong leader. Moreover they should have the ability to motivate teachers as well as create a feeling of trust in others (Tesema, 2014). Subject advisors must know how their own interpersonal behaviours affect individuals as well as groups of teachers and then study ranges of interpersonal behaviours that might be used to promote more positive and change-oriented relationships (Glickman, Gordon and Ross-Gordon, 2004).

In a study conducted by Ozdemir and Yirci (2015) participants underlined that for effective communication it is necessary for educational supervisors to display constructive attitudes, especially during their interactions with teachers and to avoid subjective behaviour. They add that educational supervisors can be rated on how they perform their duties and responsibilities based on the effectiveness of their supervision. Physical Science performance in South Africa needs to improve and issues like interpersonal relations between teachers and subject advisors should not be a deterrent for this. In a way interpersonal skills have an impact on the competence for both subject advisors and the teachers they support. The relationship between the supervisor and the supervised agents becomes a crucial element for effective supervision (Kilminster & Jolly, 2000). Education supervision is underpinned by several key principles including active listening, mentoring, creating a supportive learning environment, providing constructive feedback, encouraging reflective practice and developing insightful or self-aware approaches in teachers (Ekundayo, Oyerinde & Kolawole, 2013). Upgrading teachers' skills requires a good rapport by using a collegial approach and respect of individual differences (Oyaya, 2007).

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2.5 CURRICULUM MANAGEMENT BY SUBJECT ADVISORS

The core function of subject advisors which include the Physical Science subject advisors in all parts of the world is effective curriculum management (DoBE, 2013). A curriculum is a set of subjects and their content offered at a school. It is prescriptive and is based on a more general document that specifies what topics must be understood and to what level to achieve a particular grade or standard in an education system (Amachukwu & Ololube, 2015). The KZN Strategy of 2012 defines curriculum as what a learner is required to encounter, study, practice and master. It entails taking decisions about what should be taught, how it should be taught and when it should be taught. The core elements of the curriculum are teaching, learning, assessment and resources used for teaching and learning.

Curriculum management is the essential function of the entire education. It relates to methodology for curriculum delivery which outlines the best ways of imparting knowledge, values, processes and attitudes to learners in a manner that prepares them not only to achieve the learning goals but also to excel in their achievements. Curriculum management has a responsibility to create and maintain an environment to support curriculum delivery. In order to support curriculum, one requires strong leadership across the system, beginning at head office, culminating in the classroom (KZN Strategy, 2012). In Tanzania with regards to an advisory role, the school inspectors are expected to disseminate information on accepted practices and innovation, curriculum implementation and reviews, identifying training needs and organizing programs close to school training (Kambuga & Dadi, 2015).

In South Africa curriculum management also includes development and support of inclusive education (DoBE, 2013). Diko, Haupt and Molefe (2011) indicate that roles of subject advisors are not only limited to manage curriculum delivery, but stretched to internal assessment and examination processes. Roberts (2001) concedes that the primary function of school districts is to support the delivery of curriculum in schools and to monitor and enhance the quality of learning experiences offered to learners. Since subject advisors' task is curriculum management, their focus should be on the professional development of teachers which implies empowering, supporting and developing teachers so that they can effectively deliver quality education.

The roles and responsibilities of subject advisors in the "guidelines for organization, roles and responsibilities of education districts" 2011 are vague. The document only indicates that the duties and responsibilities of district officials are individual and varied, depending on the nature of the responsibilities attached to each post. These include but are not limited to subject advisory services, administration and policy development processes. Since this study was conducted in one South African province, the researcher considered its presentation document on the roles of subject advisors as shown in the diagram below which was presented at subject advisors meeting in January 2012 using legislative policy documents on the right column. This does not differ with other provinces in South Africa.

Table 2.1: Roles and responsibilities of subject advisors- a presentation for the sampled province

GDE MOTTO: 80% SUPPORT AND DEVELOPMENT , 20% COMPLIANCE		
80%: SUPPORT AND DEVELOPMENT	**20%: COMPLIANCE**	**LEGISLATION**
• Provision of resources (provide subject materials-work schedules, assessment programs and formal activities plus support content material and intervention strategies) • Support teachers in effectively delivering the curriculum in the classroom (through classroom observation.	• Teachers have all the requisite curriculum and assessment documents (check that these are available and followed faithfully) • Record keeping	• Circular 129/1998 • Circular 38/2007 • Circular 62/2007 • Circular 65/2008 • Education Amendment Law Act • Circular 02/2010 • EEA

• Strengthen teachers' content knowledge (Through information sessions-workshops, PLCs) • Moderate SBA (ensure quality assessment practices of both formal and informal assessment tasks) • Discuss strategies to improve performance (through feedback sessions and guidance). • Engage with teacher & HoD's on their APIP (during feedback sessions) • Advising schools on procuring of resources	(Marks for formal tasks and subject record of Physical Science LTSM) • Checking that teachers have all necessary support material • Follow –up activities	

This study incorporates the roles and responsibilities in the factors discussed in the ensuing sections.

2.5.1 Professional development of teachers

Professional development can help overcome shortcomings that may have been part of teachers' pre-service education and keep teachers abreast of new knowledge and practices in the field (UNESCO, 2000). Continuous teacher professional development and good teaching are the key to unlocking excellence in learner performance (NEEDU report, 2012). Phoshoko (2015) adds that professional development for teachers is an essential component of their growth and progression in the profession as they endeavor to offer quality teaching. The on-going professional development of teachers is a priority in many countries around the world. It is viewed as the most effective approach to improve the teachers' instructional practices after they enter the workforce (Fraser, Kennedy, Reid & McKinney, 2007).

Teachers' level of professional development affects their learning processes, their attitudes towards teaching, their self-efficacy and has an impact on student learning (Vermunt, 2014). Continuous Professional Development programs vary widely in their format and content (Jita & Mokhele, 2014). In order to achieve the goal of quality teaching, subject advisors need to monitor and support teachers on curriculum subject matters. The South African *policy on the organization, roles and responsibilities of education districts 2011* indicates that subject advisors must have direct contact with teachers and receive direct advice from provincial head office curriculum and assessment specialists in order to support teachers (DoBE, 2011c).

The contact is achievable through on-site support done during school visits where subject advisors are allowed to observe teaching practices in classrooms, through content and pedagogical content knowledge workshops where subject advisors facilitate content and PCK related matters and professional learning communities where the subject advisor coordinate interactions by teachers to discuss subject related matters. Education supervision is an organizational function that seeks the growth of teachers and improvement in teaching performance and greater student learning (Tesfaw & Hofman, 2012).

2.5.1.1 On-site support through school visits

Subject advisors' visit to schools mainly focuses on classroom visits with teachers to observe lessons taught. The visits are regular and in addition to lesson observation, they check lesson notes and other records. This is regarded as academic supervision (Orenaiya, Adenowo, Aroyeun & Odusoga, 2014). Researchers and practitioners generally agree that the most effective use of classroom observation is for professional development (Montgomery, 2002). Okendu (2012) agrees that instructional supervision done during school visits is regarded as the process of enhancing the professional growth of the teachers, the curriculum and improving the techniques of teaching in the classroom through democratic interactions between the teacher and the supervisor.

Obiweluozor, Momoh and Ogbonnaya (2013) add that school visits by supervisors should aim at providing academic guidance to the teachers and help the institution in the promotion of a higher standard of education. It should not aim at fault finding of the teachers and their work but for providing concrete suggestions for the improvement of teaching, class work, homework and its corrections. Nakpodia (2006) asserts that classroom visits can help in the identification of areas of strength and weaknesses of teachers and follow-up activities that should be directed at the improvement of identified areas of teachers' weaknesses. Subject advisors visit school to carry out multiple activities which ensure that quality education is achieved. Depending on the need for support required by the teachers at schools, subject advisors might conduct routine visits, clinical visits, preventive visits, creative visits or follow up visits (Ojelabi, 1981 in Olulube & Major, 2014). These types of visits are discussed below.

(i) Routine visits

Routine visits are short visit made to schools in which no formal reports are written but brief comments are made (Ojelabi, 1981 in Olulube & Major, 2014). This is a Nigerian case; in South Africa reports are written for every school visit. Subject advisors visit schools and use monitoring tools that cover all the areas related to teaching and the organization and management of teaching. One of the aims of such supervisory visits is to look into what is happening and if work is being done (Onasanya, 2008). With regards to subject advisors these visits can be used to monitor curriculum progress and compliance especially for novice teachers.

(ii) Clinical visits

UNESCO (2007) states that educational supervision is a positive process, which enables supervisees to gather feedback on their performance, to chart their continuing progress and to identify their developmental needs. It is a forward looking process that helps supervisees to select the most appropriate strategies for meeting these needs. Sergiovanni and Starratt, (2002) explain clinical supervision as a face-to-face contact with teachers with the intent of improving instruction and increasing professional growth. They explain the purpose of clinical supervision as being to help teachers to modify existing patterns of teaching in ways that make sense to them and in ways that support content or teaching standards.

Here, the role of the supervisor is to help the teacher select goals to be implemented, teaching issues to be illuminated and to understand their practice better. This can improve teacher instruction, classroom management and motivate students. Supervisors work with teachers in a collaborative way, and provide expert assistance to teachers with the view of improving instruction. During and after clinical visit, inspectors analyse the information and discuss their analysis with teachers for the improvement of instruction. Subject advisors give pedagogical evaluation of the teachers' work as well as advice during school visits. In this way teachers are seen to be engaged in continuous learning that leads to quality teaching and learning (Lugaz & De Grauwe, 2010).

(iii) Preventive visits

In a preventive type visit, the inspectors anticipate problems beforehand and, as such, try to assist teachers avoid those problems/shortfalls/deficiencies. This type of inspection helps teachers to meet situation with confidence as they predict the problems beforehand and act as friend and guide. Therefore, this type of inspection is more useful and helpful in every respect as compared to the traditional type (Ojelabi, 1981 in Olulube & Major, 2014). It is very useful if teachers are to implement something new like for example the CAPS policy document for Physical Sciences.

(iv) Creative visits

In this type of visit, both the teacher and the inspector feel open-minded. This system promotes freedom flexibility and encourages open mindedness. In this situation, teachers and the inspectors, work together, collaborate, evaluate and describe each other's work. This encourages teachers in all respects. This can be called the best type of inspection. It is very effective if the performance of learners does not seem to be improving over a prolonged period of time. Contextual factors leading to an unchanged situation and subject improvement strategies can be discussed with affected teachers during creative school visits (Ojelabi, 1981 in Olulube & Major, 2014).

(v) Follow up visits

This type of visit is a follow up of previous visits. The inspector investigates whether the suggestions, corrections and recommendation made during the previous visit have been carried out by affected schools. The visit is to ascertain to what extent the corrections and suggestions provided are helped in achieving the educational objectives. In some cases a follow up visit might be required to investigate whether the suggestions, corrections and recommendations made during the previous visit have been carried out by affected schools (Ojelabi, 1981 in Olulube & Major, 2014).

2.5.1.2 Professional development of teachers through workshops

Supervision is an educational sub-system that guides and counsels the professional development of teachers and offers effective support for educational workers in order for them to achieve their goals (Munemo & Tom, 2013). The ever-changing environment with which students have to contend as they learn puts added pressure on the teachers and education authorities on how to adapt teacher professional development (TPD) in order to meet these needs (Phoshoko, 2015). Professional development activities through workshops offer opportunities for active learning or for teachers to become actively engaged in the meaningful analysis of teaching and learning where for instance they review students' work or obtain feedback (Nasser, Kidd, Burns,& Campbell, 2013). Evans, Thornton and Usinger *(*2012) further corroborate that professional development and support encourage quality upfront.

An on-going objective of most professional development programs is to provide experiences that create change in classrooms and support reform-oriented teaching (Pop, Dixon & Grove, 2010). Group work achieved through workshops enhances the knowledge of teachers at different developmental levels by the collaboration of ideas, regardless of experience or accomplishments, which initiates cohesiveness and creates a team amongst educators. Campbell and Chittleborough (2014) indicate inconsistent expectations of the Science curriculum requirements and how the pressures of a crowded curriculum influence how Science is taught. As a result Physical Science workshops should focus on content and pedagogical content knowledge if they are to improve the quality of the subject. Cobern, Schuster, Adams, and Skjold (2013) add that an important goal for science teacher education is to acquire knowledge of Science teaching pedagogy.

To be effective, professional development activities (PDAs) should be focused on ways of teaching that can improve learners' learning (De Clercq & Shalem, 2012). Continuing professional development (CPD) can help teachers to increase their knowledge and change their instructional practices (Borko, 2004). The districts are vital institutional actors in education reforms (Rorrer, Skrla & Scheurich, 2008). An essential component of any professional development program for Science teachers should be to strengthen their content knowledge (Campbell & Chittleborough, 2014). The yearbook 2012/2013 adds that as part of intervention strategies, district officials should organize training for personnel.

2.5.1.3 Professional development through professional learning communities (PLCs)

Initially in South African provinces, education districts were encouraged to use the cluster system to train teachers on common tasks for assessment. Soon, clusters became platforms for teachers to share best practice and/or problems with a view to generating concrete ideas for improvement. The use of teacher clusters forms part of the drive to improve teachers' classroom practices and learner performance (Jita & Mokhele, 2014). The one-size-fits-all approaches of traditional workshops have shown limited effectiveness because of the strong central control and limited room for teachers' voices leading to inadequate professional appreciation. As a result some teachers might then ignore, modify, abuse, misinterpret or even distort the intention of the envisaged educational policy changes (Towndrow, Tan, Yung & Cohen, 2010).

Researchers have compared cluster meetings to communities of practice which have the potential of deepening aspects of teacher knowledge and practices. PLCs, previously known as clusters and otherwise referred to as curriculum support groups, are considered a valuable means of promoting school and system-wide capacity building for sustainable improvement and pupil learning. They fulfill a need for more professional development that is authentic and relevant to teachers' need. The process of PLCs helped change school districts by creating high-performing collaborative teams, developing a district-wide sense of efficacy and emphasizing the use of data to improve education (Anderson, Mascall, Stiegelbauer & Park, 2012).

The use of PLC's for professional development is one of the recently adopted and popular forms of CPD in South Africa (Jita & Mokhele, 2014). Singh and Pandey (2013) concede that structural featured professional development activities such as teachers networking, augurs well for the improvement of education especially in the case of South Africa where the legacy of apartheid had caused such immeasurable harm. Desimone, Hochberg, Porter, Polikoff, Schwartz and Johnson (2014), argue that professional development of teachers requires active participation of those involved. They add that coherence in teacher development can be increased by incorporating experiences that are consistent with teachers' goals, aligned with state standards and assessments, and encourage continuing professional communication among teachers. Curriculum support groups can act as a structure in which development can take place over a long time.

Teachers can learn in collaboration in communities of practice and in an environment of trust, helping to address actual classroom practices (White, 2013). Anderson, Mascall, Stiegelbauer and Park (2012) indicate that PLCs help change school districts by creating high-performing collaborative teams. Teachers from schools in mutual clusters experience less stress and difficulty when implementing a new curriculum (Muijs, 2008). Research has shown that PLCs may enhance teacher quality, which is the most important factor in enhancing learning outcomes (Hattie, 2012). The quality of Physical Science performance relies mostly on the content knowledge of teachers and subject advisors. (Vieluf, Kaplan, Klieme and Bayer, 2012) argue that effective professional development should focus on subject matter knowledge, be grounded in a common set of professional development standards and show teachers how to connect their work to specific standards for student performance. These are possible in PLCs as opposed to traditional workshops.

Katz and Kahn (2009) add that PLCs create the conditions for teachers to move outside their typical contexts to engage with a broader scope of ideas and to participate in professional conversations that create new knowledge that extends beyond individual knowledge. In Saudi Arabia evidence suggests that the process of PLCs has helped change school districts by creating high-performing collaborative teams, developing a district-wide sense of efficacy, and emphasizing the use of data to improve instruction (Almannie, 2015). PLCs have been reported to assist teachers to positively influence student achievement. However, in order for this to occur, the superintendent (subject advisors in a South African context) must be a highly visible actor in the process of change and must be decidedly engaged in the majority of visioning and mission-setting activities (Anderson, Mascall, Stiegelbauer & Park, 2012).

The subject advisor facilitates the formation of PLCs and monitors their functionality hence he/she is a gatekeeper of these groups. With the use of PLCs the assumption is that, by reflecting together, with professional facilitation, teachers can learn from context-specific problems, learners' errors, and about topic-specific teaching strategies. PLCs are organized by district advisors by gathering teachers from neighbouring schools to a venue close by (De Clercq & Shalem, 2012). Teacher networks enable teachers to work together on problems they experience in practice, and thus promote their own CPD. A curriculum support group consists of the subject advisor of the specific subject, a group leader and teachers from neighbouring schools.

The role of the subject facilitator entails administrative issues as well as support for teachers. The subject facilitator must establish the curriculum support groups for a specific subject and appoint a leader for the group. Dates and venues for the meetings during the year must be set in consultation with the leader of the specific group. The subject facilitator should assist the curriculum support leader with planning an agenda for the meetings. It is also expected that the subject advisor will follow up on non-attendance of teachers. If support is needed by the group, challenges are addressed in the reports by the group leader. The subject advisor should address these needs and challenges at subsequent meeting (White, 2013). PLCs promote collaborative teacher reflection on and learning from practices, and set higher standards of practice and ethics, but can only function if supported by outside experts with professional knowledge and understanding of context (De Clercq, 2013).

2.6 WHAT DO SUBJECT ADVISORS MONITOR?

Obadara (2005) viewed teachers to be highly essential for a successful operation of the education system and as a key to educational development. All over the world, teachers are tasked with the responsibility of alleviating learners' challenges associated with the learning of Physical Science. Teachers are pursuing innovative techniques for improving the understanding of Science and increasing its pass rates (Naidoo & Paideya, 2015). Knowledge of Science is important for the social and economic progress of South African society. Ehren and Visscher (2008) indicate that the management role of the curriculum advisor is seen as an essential part of the teaching establishment. Ololube (2014) argues that specialized subject areas like Science in teaching cannot be achieved if adequate supervision mechanisms are not put in place to effectively monitor, control and manage the activities. The diagram below represents curriculum aspects which subject advisors should support and monitor at schools:

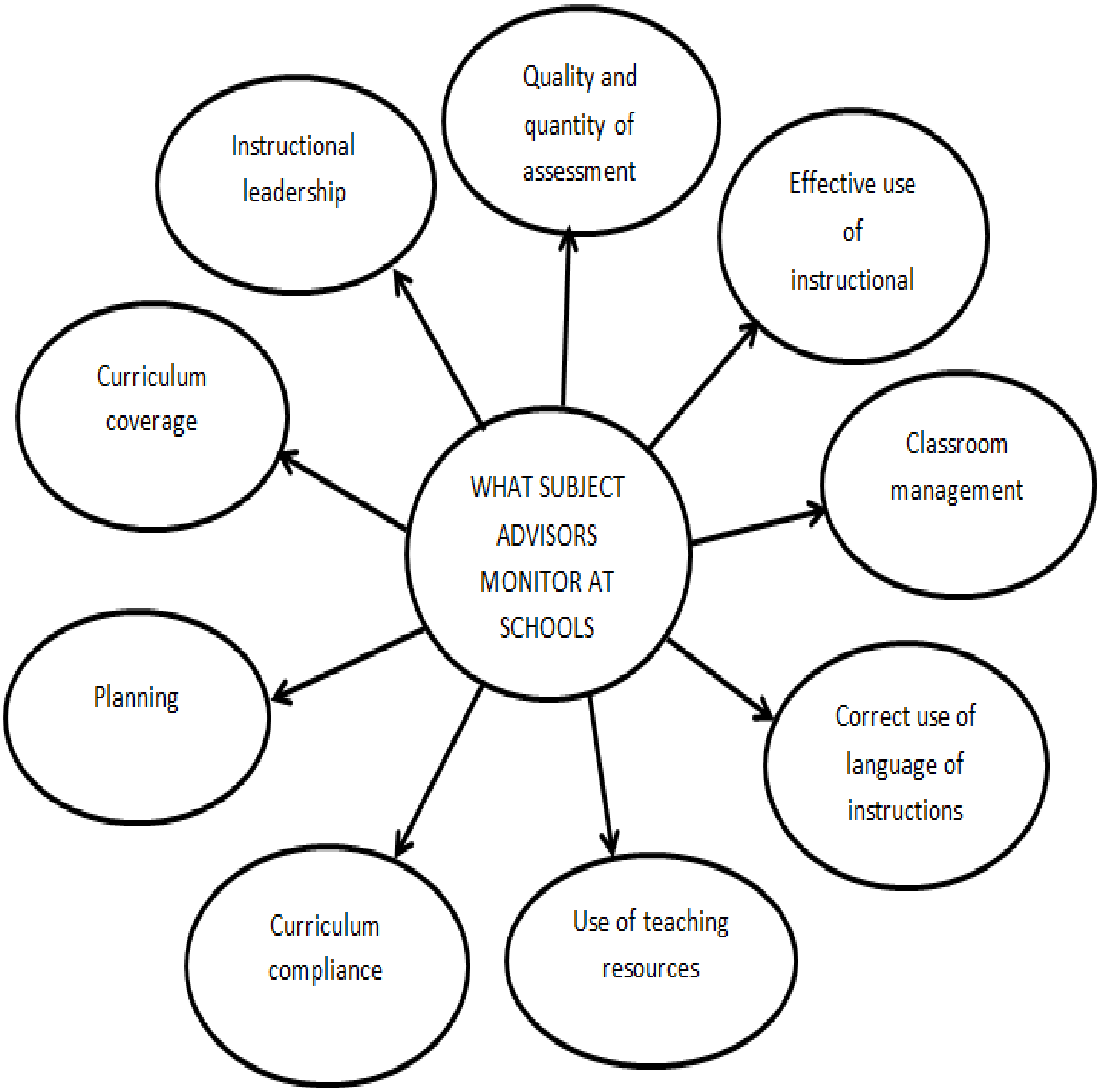

Fig 2.2: Curriculum aspects monitored by subject advisors

2.6.1 Planning

Teachers have a role in determining what is needed or what works best with learners (Eslami & Fatahi, 2008). Instructional planning is considered to be the first step in improving classroom instruction. It includes lesson plans, unit plans and year plans. The lesson plan shows the level of preparedness and the effort the teacher made in gathering information for the lesson. A lesson plan indicates how the teacher is committed through his teaching (Obiweluozor, Momoh & Ogbonnaya, 2013). All developmental and planning activities need guidance and direction at every stage (Olulube & Major, 2014). In other words, educational management should help teachers to achieve their goals through lesson plans, schemes of work and participatory management (Okumbe, 2007). Supervisors should help teachers in planning, in the selection of strategies and resources, and in monitoring and evaluating those strategies. They should also help teachers to develop and improve their skills in instructional design and to use models of instruction to guide this instructional planning (Olulube & Major, 2014).

2.6.2 Curriculum coverage

Curriculum coverage is one key area of school functionality stemming from instructional leadership that could be more effectively monitored (Van der Berg, Taylor, Gustafsson, Spaull & Armstrong, 2011). Roberts (2001) believes that different areas of operation by district officials should be aligned to support the district's primary purpose which is teaching and learning. Roberts (2012) also argues that the core purpose of educational districts in South Africa is to support the delivery of the curriculum and to ensure that all learners are afforded good quality learning opportunities which are evidenced by learner achievement. In CAPS (2011) the scaffolding of curriculum coverage is already in place for accurate monitoring and must be adhered to (Van der Berg, Taylor, Gustafsson, Spaull & Armstrong, 2011). District officials should monitor curriculum coverage to ensure that all the topics in a subject have been covered according to the annual teaching plan. This would ensure that all topics receive due attention, allowing candidates to be better prepared for the examination (GDE, 2015).

2.6.3 Quality and quantity of assessment activities

The output of quality is reflected through the performance of learners. With the changes in the education system, there are concerns about the standards of curriculum and assessment made to award qualification in the system. Educational supervision programs should expose teachers to various and current assessment techniques. This will help teachers to design effective classroom exercises, tests and examinations, use practical ways of diagnosing the strengths and weaknesses of learners and suggest ways and solutions for their difficulties (Donkoh & Dwamena, 2014). Quality of knowledge is about enhancement of cognitive skills through the schooling experience.

In other words, good schooling should be about the development of highest levels of cognitive skills (Mwinyipembe & Orodho, 2014). The quality and evaluative mechanism of any level of education system in secondary schools is the performance of teachers and the numbers of good grades obtained by learners in the subjects examined at the end of a terminal class (Orenaiya, Adenovo, Aroyeun & Odusoga, 2014). A growing body of evidence suggests that schools can make a great difference in terms of learner academic performance and a substantial portion of that difference is attributable to teachers, thus there should be a link between teacher productivity and learner academic performances (Fehintola, 2014). Good teachers are skilled not only in instructional methods, but also in evaluation and assessment practices that allow them to gauge individual student needs (Nzoka & Oroho, 2014).

Reviews of learner workbooks can provide telling information about the coverage of curriculum and practice of exercises within classrooms, and could therefore be used for the purposes of monitoring (Van der Berg, Taylor, Gustafsson, Spaull, & Armstrong, 2011). Teachers should have expertise with aligning curriculum to assessment and keeping subject matter aligned to intended curriculum (UNECSO, 2004). The monitoring process by subject advisors should focus on the standard and quality of the tasks used for SBA and whether these tasks are preparing learners for questions at different cognitive levels well before the NSC examinations (GDE, 2015).

2.6.4 Instructional leadership

Instructional supervision is regarded as the process of enhancing the professional growth of the teachers, the curriculum and improving the techniques of teaching in the classroom through democratic interactions between the teacher and the supervisor (Okendu, 2012). Instructional process and supervision help in improving academic performance of students (Dangara, 2015). Nakpodia (2006) asserts that instructional supervision in the modern era centers on the improvement of the teaching-learning situation to the benefits of both the teachers and learners. It also helps in the identification of areas of strength and weaknesses of teachers, follow-up activities that should be directed at the improvement of identified areas of teachers' weaknesses, giving recognition to teachers and creating a cordial working atmosphere based on good human relations. Instructional supervision constitutes the leverage point for instructional improvement, teacher's competence and efficiency of the education system.

The CAPS policy document indicates that Physical Sciences investigate physical and chemical phenomena through scientific inquiry, application of scientific models, theories and laws in order to explain and predict events in the physical environment (DoBE, 2011a). These outcomes could only be met if teachers use innovative teaching strategies that juxtapose the learning outcomes with the relevant assessment standards. For example, in Grade 11 Chemistry, teachers teaching Boyle's Law are not only required to collect data to verify textbook information, but they are also required to develop learners' insight into the objectives and rationale behind these experiments by explaining what led Boyle to arrive at these laws. Here teachers might need to be knowledgeable about the work of Torricelli and his experimental evidence for atmospheric pressure and how he designed the barometer from which Boyle derived his theories (Koopman, 2013).

An unsupervised instruction may mar the standard of education (Archibong, 2010). Properly structuring instruction with learner engagement, ensuring frequent monitoring and feedback on learning progress with reinforcement related to assessment outcomes are all crucial factors for effective learning to take place (Scheerens, 2005). Multivariate statistical analysis of learner performance in the NSES has confirmed that various indicators of instructional leadership are indeed associated with learner outcomes (Taylor, 2011). Methodology for curriculum delivery is linked to the intention to increase the number of distinctions in key subjects like Physical Science (The KZN strategy, 2012).

The National Open University of Nigeria (NOUN) (2006) observed that supervision provides opportunities for teachers to be groomed through critical study of instructional processes and classroom interactions to carry out their teaching tasks in line with professional codes of conduct. With regard to an advisory role, the school inspectors are expected to disseminate information on accepted practices and innovation, curriculum implementation and reviews (Kambuga & Dadi, 2015). When district officials who are supervisors of the teaching and learning process support teachers, they monitor their performance and make interventions where there is a need in the hope of bringing about increased learner performance (Mavuso, 2013).

2.6.5 Effective use of instructional time

Whether a teacher uses traditional or more current methods of instruction, efficient use of school time has a significant impact on student learning. Teachers' presence in the classroom represents the starting point (Nzoka & Orodho, 2014). Learning occurs when teachers engage students in instructional activities, rather than attending to administrative or other non-instructional processes (Wore & Orodho, 2014). Knowledge about ways of organizing one's teaching over time is imperative in the learning progress. This includes the sequencing and pacing of the content to be covered, using a coherent lesson structure, establishing routines of work, selecting learning material for teaching and designing learning and assessment activities focused on how to order and structure teaching (De Clercq & Shalem, 2012). According to Ndou (2008), the introduction of a new school curriculum necessitates a fresh look at time management to improve the quality of curriculum change implementation.

2.6.6 Classroom management

Good classroom management facilitates the teaching and learning process. It includes: ability to discipline and control students, reward or reinforce good performance/ conduct, to identify cases and causes of student misbehavior, to create a conducive classroom atmosphere, classroom arrangement and the physical condition of the classroom (Obiweluozor, Momoh & Ogbonnaya, 2013). Both teachers and school management agree that discipline is among the most serious problems in schools today. Establishing an orderly classroom environment with a task-oriented climate and appropriate discipline factors and mutual respect are all crucial factors for effective learning to take place (UNESCO, 2004). Teacher expertise in instilling mutual respect and appropriate discipline deserve more attention in the post 2015 agenda (Iyengar, Jaschke, Shin, Quintana, Mahal, Ruto, Karuti & Jeantillone, 2015).

Classroom management techniques such as making children sit in groups of circles based on their reading levels is much more effective than all children sitting together (Banerji & Wadhwa, 2012). Zuljan (2007) indicated that all teachers possess conceptions that influence their thinking, instructional decisions and classroom management. Supervision can help teachers to acquire better classroom management skills (Olulube & Major, 2014). Supervision should seek to enable teachers to develop preventive and corrective measures of discipline in the classroom (Ekundayo, Oyerinde,

& Kolawole, 2013). Donkoh and Dwamena (2014) recommend that educational supervision should help teachers in managing their classrooms effectively, that is, it should assist teachers to be made aware of the different techniques of classroom management. Teachers should also be encouraged and assisted to establish positive rapport with their learners to enable them to express their ideas and feelings.

2.6.7 Correct use of the language of instruction

Language has far reaching effects on educational quality hence critics usually link achievement to language of learning and teaching. There are a number of “generative mechanisms” through which language factors affect learning outcomes (Fleisch, 2008). There are clearly linguistic factors such as the density of unfamiliar words. Also the practice of code-switching, common in South African classrooms effectively doubles the time needed to teach concepts through the need to repeat information in two languages. The majority of the English second language teachers in the study preferred the use of both English and the learners’ main language(s) as medium of teaching (Mokiwa & Msila, 2013).

Some researchers believe that South Africa’s poor performance, as measured in local and international tests, is driven primarily by the language disadvantage. Hoadley (2012) adds that teachers’ poor proficiency or superficial fluency in the language instruction in South African classroom is one of the major obstacles to better teaching and learning. Another generative mechanism is that many African language learners are taught in English but are not frequently exposed to English outside of the classroom. The majority of teachers in South Africa is from a language background other than English, but teaches Science in English (Mokiwa & Msila, 2013). This is especially true of many rural areas where English is effectively a foreign language. Most South Africans and Black South Africans, in particular, speak one or more indigenous language and this multilingualism has far reaching effects on educational quality.

Research shows that the self-perceptions of teachers who are non-native speakers of English acknowledge the challenges they encounter in the second language classrooms. They are aware of their different proficiency in comparison to English first language teachers and affirm that this lower proficiency in English exerts negative effects on their teaching (Braine, 2006). Howie (2003), for example, believes that “the most significant factor in learning Science is whether they are fluent in English.” Mokiwa and Msila, (2013) adds that Science teachers should continually improve their language use in classrooms.

Science deals with aspects such as kinetics, audio-visual aspects as well as the sense of smell and touch. Effective teachers should be able to explain these in the language simple enough for learners to grasp. Correct use of the language of instruction should be used in a way that it will help learners to understand and hence answer examination questions. The use of language must focus on examination techniques, particularly in Grades 10–12. Strategies that could productively be employed include on-going informal assessment of terminology and definitions, and when revising past papers, reading, analysing and discussing the requirements and action verbs of questions with learners, before requiring them to answer the questions (GDE, 2015).

2.6.8 Effective use of teaching resources

Globally, teachers are tasked with the responsibility of alleviating learners' challenges associated with the learning of Science. They pursue innovative techniques for improving the understanding of and increasing the pass rates in Science (Naidoo & Paideya, 2015). Learning support materials have been identified as an essential element of teacher’s professional development (Selesho & Monyane, 2012; Moodley, 2013). Borg, Karlsson, Hesook and McCormack (2012) argue that knowledge for practice is embedded in knowledge-in-practice, and that knowledge construction needs to be generated in relation to what actually happens in actual practice. Learners need to be involved when generating new knowledge in the classroom.

Instructional supervision is necessary for all the subjects offered in secondary schools as an intervention and a predictor of positive academic achievement (Orenaiya, Adenowo, Aroyeun and Odusoga, 2014). Methods of teaching are an important part of effective instruction in the classroom. The supervisor should thus help teachers to learn about modern methods of teaching and to apply these in the classroom (Ololube & Major, 2014). For example, new education reforms may require a revised use of technology teaching resources. The education system in the Kingdom of Saudi Arabia faces new challenges, many of which are the result of advances in information and communication technologies, and increased globalization and competition among nations, which has created demands for skills that Saudi education needs to promote (Tatweer, 2012).

The present era wherein the world is considered a ‘global village’ has seen enormous developments in knowledge leading to new, technological ways of teaching and learning (Donkoh & Dwamena, 2014). Kankam (2013) indicates that the emergence of the information and knowledge-based society has brought a change of mind-set in learning and that new approaches to learning necessitate new approaches to teaching which challenge the teacher’s role as a facilitator of learning. This is currently the case in sampled province where the introduction of paperless classrooms requires teachers to alter their teaching methods in order to effectively deliver curriculum. This makes educational supervision, which is a co-operative problem-solving process, a crucial concept in the professional development of teachers (Hismanoglu & Hismanoglu, 2010).

2.6.9 Curriculum compliance

Compliance means an action or fact of obeying an order or a request (Oxford, 2008). Every country has a set of standards used as a benchmark for attainment of minimum requirements in education, for example in Nigeria secondary schools are expected to function in compliance with the achievement of the national education objectives, and consequently aspire to brilliant performance in the final examination Alimi & Akinfolarin (2012). The “No child left behind” initiative in the US has been thought to facilitate and ensure proper education policy implementation and to make teachers more sensitive to every learner's learning needs (Sergiovanni & Starratt, 2007). In countries such as Senegal, Guinea, Benin and Mali district offices play the role of ensuring policy implementation (Mavuso, 2013).

Isa and Jailaini (2014) stress that supervision in a school system implies the process of ensuring that the policies, principles, rules, regulations and methods prescribed for purposes of implementing and achieving the objectives for education are effectively carried out. Wanzare, (2002) adds that curriculum must be delivered properly if it is to have impact on student learning There have been real concerns that some schools do not implement their curriculum and that some teachers do not know what is expected of them. District officials play a fundamental role of overseeing the implementation of policies developed by the DoBE (Bantwini & Diko, 2011).

In a South African case, the CAPS policy document is used to guide curriculum depth and breadth therefore compliance in their context refers to content coverage and assessment practices as prescribed by the CAPS policy document. It is very imperative that teachers understand how best to teach their subject in accordance with the prescribed curriculum. Assessment plays a vital role in teaching and learning hence this study concurs with Mwinyipembe and Orodho (2014) that effective implementation of standards assessment requires that all the actors understand their roles and the outcome of supervision. Subject advisors visit schools to ensure that the correct curriculum is implemented (DoBE, 2011c).

2.7 THE NEED FOR CURRICULUM SUPPORT AND DEVELOPMENT

Education is recognized as an instrumental foundation for realizing all other rights in which governments play a crucial role (Iyengar, Jaschke, Shin, Quintana, Mahal, Ruto, Karuti. & Jeantillone, 2015). It is recognized across the world as the most vital form of public service (Mansell, James & The Assessment Reform Group, 2009). Education remains the biggest instrument for academic progress, social mobilization, political survival and effective national development of any country (Dangara, 2015). Quality education is an unavoidable expense which must be undertaken by each and every country (Nkinyangi, 2006). Through education, knowledge and skills are acquired and this in turn enables a country to develop socially and economically (Ololube, 2014).

The World Education Forum (WEF) held in Dakar, Senegal in 2000 implicitly and explicitly calls all countries to improve all aspects of the quality of education provided in the society (UNESCO, 2004). There is a strong relationship between education provided and the level of development of a particular nation (Galabawa, 2005). International research over the past years has reported extensively on the positive effects of academic leadership in implementing academic programs and improving academic prowess in schools (London, 2004). In many countries including South Africa there has not been positive reports on the performance of Science education due to the historical trajectory.The solution is a well-functioning school inspectorate to determine and promote good education (Ehren & Visscher, 2006). Carrying out supervision in schools ensures that teachers within the school system have been performing the duties for which they are scheduled (Obiweluozor, Momoh, & Ogbonnaya, 2013). Monitoring of the curriculum help subject advisors to identify issues requisite for curriculum delivery as discussed below.

2.7.1 Acquire an overview of the quality of teaching and learning

According to Wanzare (2002) and Kamuyu (2001), one of the reasons that inspection is carried out in schools includes acquiring an overview of the quality of education in accordance with performance indicators for an education system. Quality of knowledge is about enhancement of cognitive skills through the schooling experience. In other words, good schooling should be about the development of highest levels of cognitive skills (Mwinyipembe & Orodho, 2014). School inspection is the central frame through which the government can monitor and ensure the quality of education provided in the society (Matete, 2014). This is true for all countries that implement inspection or subject advisory for schools.

In Kenya, demand for educational quality is also increasing, as the government of Kenya views the satisfactory performance of the basic education system not only instrumentally but also strategically in relation to economic development and international competitiveness (UNESCO, 2012). As a result, the supervisory role of schools is deeply entrenched in the Laws of Kenya Chapter 211 known as Education Act which gave the inspectorate a legal backing (Republic of Kenya, 2012a, 2012b). Section 18 of the Education Act of Kenya states that "school inspectors appointed by Ministry of Education be charged with authority to enter and inspect any school, or any place at which it is reasonably suspected that a school is being conducted, any time, with or without notice and to report"(Republic of Kenya, 2013).

In South Africa subject advisors report on findings each time that information is collected from schools. The information gathered in reports is kept to inform and improve the system. School visits thus provide an overview of the quality of education per subject. During lesson observation, the focus of monitoring is focused on quality teaching and assessment practices which is described by De Grauwe (2012) as diagnostic monitoring. Lugaz and De Grauwe (2010) add that district support for schools is part of the monitoring process to achieve quality. Milondzo and Malatji (2015) concede that the quality of teaching and learning depends on the quality of supervision conducted by educational managers in every cluster of circuits.

2.7.2 Ensure that minimum standards are met

Inspection is carried out specifically to ensure that minimum standards are maintained in the basic activities of teaching and learning. This encompasses content coverage, resource provision, maintenance of discipline and keeping of statutory records and accounts, and also provides opportunities to identify the challenges confronting the school and the level of success achieved in the pursuit of school goals (Akinwumiju &

Agabi, in Isa and Jailaini, 2014). One of the crucial reasons for curriculum management is to ensure that teachers within the school system have been performing the duties for which they are scheduled (Obiweluozor, Momoh & Ogbonnaya, 2013).

Since subject advisors monitor implementation of curriculum, the focus becomes predominantly on observing teaching methodology, content knowledge and assessment. Moderation of formal tasks is another way of ensuring that minimum standards are met. Diagnostic monitoring (De Grauwe and Carron, 2007) focuses also on the instructional process, that is, what happens in the classroom. The subject advisor is more concerned with seeing to it that learners learn what they are supposed to learn. This helps to guarantee relatively equal educational opportunities for all by ensuring that the same school standards are maintained across the country (Wansare, 2002). The South African CAPS document cites equal education as one of the principles of the Science subject policy.

2.7.3 Provide advice and guidance

Supervision provides an opportunity for academic guidance by an experienced teacher or expert/specialist in different school subjects so that newer or junior teachers are able to develop their skills and capacity (Ololube & Major, 2014). It is a way of advising, guarding, refreshing, encouraging, stimulating, improving and overseeing their cooperation in order for the supervisor to be successful in their task of supervision (Nkechi, Umemetu, & Ogbonnaya, 2013). Supervision of instruction aims at enhancing teaching and learning through proper guidance and planning, and devising ways of improving teachers professionally and thereby helping them release their creative abilities so that through them the instructional process is improved and well-articulated. (Okendu, 2012). Jahanian and Ebrahimi (2013) agree that educational supervision and guidance are among the most important duties, which are required for administration of a desirable education system.

The main goal of education supervision is to modify and to improve educational status, hence it should be done using available educational supervision and guidance plans. In Kenya policy makers realized that, for effective curriculum delivery, a standards officer is expected to provide advisory services to schools on how best to improve pedagogical skills (Republic of Kenya, 2005). Wasanga (2004) indicates that the quality assurance personnel in Kenya, which is the unit responsible for inspecting education at schools, is mandated to co-ordinate, follow-up and advise on curriculum delivery. Purposeful and constructive advice can be given for the sake of improving the quality of teaching and learning in schools (Wansare, 2002; Kamuyu, 2001). When sufficient guidance is provided, job satisfaction of teachers' increases, a positive contribution to organizational commitment occurs and professional motivation increases. This has a positive impact on schools achieving their missions (Ozdemir & Yirci, 2015).

2.7.4 Provide purposeful and constructive feedback

An effective school visit is summed up by a feedback and guidance session. Ololube (2014) indicates that feedback and guidance are essential components of learning and development and so it is vital that supervisors provide supervisees with both. For supervision systems to be effective, schools must receive useful, actionable feedback on their performance (World Bank, 2010). Mavuso (2013) concedes that quality support to schools is done through inspection and mandatory advice to teachers. The officials also give pedagogical evaluation of the teachers' work as well as advice. The reports from school visits and from provincial reports can be used as instruments to foster feedback for improved practice by teachers.

Subject advisors can use examination reports as the basis for all capacity-building interventions planned for teachers in their respective subjects (workshops and on-site support) (GDE, 2015). Supervisors can also monitor the improvement plans of their teachers, looking specifically for the inclusion of recommendations emanating from the individual subject reports (Ololube, 2014). Effective feedback requires good communication skills. Supervisors need to appreciate the critical role of communication

(Treslan, 2005). Supervision includes control, guidance and communication instruments which promote an education-training standard in schools (Obiweluozor, Momoh & Ogbonnaya, 2013). In research by Ozdemir and Yirci (2015) teachers indicated that supervision is essential in the form of feedback concerning education-training activities.

2.7.5 Support teachers in improving teaching and learning

District officials are expected to give support in terms of teaching and learning to the education institutions for which they are responsible (DoBE, 2011). Schoeman (2004) supports the move for support by indicating that with regard to teaching and learning, districts are mandated to support teaching, learning and management, thereby building the capacity of schools. Mavuso, (2013) adds that the purpose of districts is to support teaching and learning in schools. Subject advisors should support teachers as a move to promote high performance in all subjects. Caldwell and Harris (2006) concede that education structures, particularly at local level, must be configured with a view to achieving student performance. In their argument they stress that students are to be at the center of the education system and perform in all settings.

This argument is supported by Mavuso (2013) in his research findings on education in Philadelphia, where district offices function as centers pursuing instructional reform and improved student achievement. Subject advisors are also expected to assist in the monitoring of assessment of learners. They have to see to it that teachers are doing their work in line with provincial guidelines and conduct school based continuous assessment (SBA) moderation for formal tasks.

2.7.6 Ensure accountability of teachers

Accountability in its literal meaning denotes the obligation that one part gives an account on the work performed to the other (Wilcox, 2000). The idea underlying accountability in education is to make the providers of education accountable to the people who pay for the education of their children (Sergiovanni & Starratt, 2007). The idea behind this practice is to make teachers more committed towards the task of educating learners and contributing towards their school achievement and excellence (Matete, 2009).

2.8 CHALLENGES IMPACTING SUBJECT ADVISORY

2.8.1 Challenges from the department of education

2.8.1.1 Neglect of subject advisors

Smith (2011) maintains that both internationally and nationally, districts have tended to be the 'neglected layer' in school systems. A study conducted by Bantwini (2010); Bantwini and King-McKenzie, (2011) on the functionality of school district officials, which also included Physical Science subject advisors, argued that there is knowledge deficiency regarding how district officials' collaborate as well as the factors that hinder their capacity to provide effective support to schools and teachers. In Kenya in respect to roles and policy in quality assurance and supervision, it was evident that the effective implementation of quality assurance and standards assessment required that all the actors understand their roles and the outcome of their supervision (Mwinyipembe & Orodho, 2014).

Little literature unpacks how district officials coordinate their activities in supporting teaching and learning in schools (Mavuso & Moyo, 2014). All the districts have a number of strategies designed to improve the quality of teaching and learning of Physical Science. Although district offices were designed to be closer to schools, less attention has been given to improving the effectiveness of districts (Roberts, 2012). Mohlala (2007) notes the district's role as that of supporting schools but explain how districts should support schools in improving the quality of teaching and learning. The responsibility for the training and support of teachers in the implementation of the CAPS in the classroom from 2012 onwards rested with the provincial departments and the districts (Olivier, 2013).

Despite the critical role played by school districts, South African school improvement literature continues to show that districts and their officials hardly received sufficient attention on their roles in the curriculum reform process (Chinsamy, 2002), creating deficiencies in policy implementation. The neglect of the district offices and their officials is at the peril of the new curriculum and policy reform implementation at the contextual level (Murphy & Hallinger, 2001). The CAPS training for subject advisors to equip them in training teachers on the new curriculum was done in a short time prior and during the implementation of this curriculum, resulting in teaching gaps for most teachers. As for the content and pedagogical content knowledge of the Physical Science curriculum there has not been any initiative for provinces to assist subject advisors to refine their existing knowledge and skills to keep with current trends in Science education.

2.8.1.2 Undefined roles of subject advisors

Khosa, (2010) noted that the role of districts in provincial education systems is to support schools with resources, systems and professional development and monitor their utilization of inputs and achievement of targets. However, the understanding of this role and how to discharge it differs from one province to the other and among the various districts within the same province. District officials struggled to prioritize the knowledge areas teachers need support on. Their work is more about monitoring policy compliance than about what teachers need most to engage more fully with the curriculum (De Clercq & Shalem, 2012). There appears to be a lack of understanding of the roles and responsibilities of different district staff, leading to confusion in the support and monitoring inputs made at school level. Successive reports and enquiries have examined and questioned the ways in which inspectors make judgments and have also considered the impact of inspection on schools (Baxter, 2013).

Mohlala (2007) noted that the roles of district officials (subject advisors) are to support schools, but he did not elaborate on how districts should support schools in improving the quality of teaching and learning. The 2011 G*uidelines on the Organisation, Roles and Responsibilities of Education Districts,* outlines the roles and responsibilities of education district officials in South Africa, but it does not give an explanation of how district officials support teaching and learning in schools, which is their major role at schools (DoBE, 2011c). Mavuso (2013) argues that it is not clear whether the primary roles of subject advisors is to give professional support to schools or to serve as administrative agents that monitor policy implementation and ensure proper administration in schools. What is apparent is that they serve both professional and administrative roles and their tasks are regulated by the provincial education department. School inspectors tend to evaluate teachers based on their own perceptions of teaching and teacher performance without considering official standards (Orenaiya, Adenowo, Aroyeun & Odusoga 2014).

2.8.1.3 Capacity of subject advisors

Van der Berg, Taylor, Gustafsson, Spaull and Armstrong (2011) suggest that in designing the functions of district offices, consideration should be given to capacity issues. Lack of capacity may limit what can reasonably be delegated to district offices. On the other hand, it may be possible to build capacity at the district level through, for example, clearly communicated role definitions and revising the selection process of district officials. They add that since it takes time for the desired level of professional capacity to be built up at the district level, support to schools must clearly be improved by focusing on improving the presence of intervention tools that district officials and other stakeholders assisting schools can easily use. Enaigbe (2009) attributed challenge associated with lack of supervision to the understaffing of inspectors, heavy workloads and time constraints.

In South Africa the size of the districts and the nature of support required by some schools do not correlate with the number of subject advisors available to support schools. Supervisors and inspectors from the Ministry of Education are usually insufficient to carry out the duties required (Ogunu, 2005). Inadequate supervisor has inimical effects on the students' output and the educational objectives may not be achieved (Eya & Chukwu, 2012). The HRDC report of 2014 cited a concern that most of the subject advisors found it impossible to visit all the schools once in a year and possibly 30% or more of the schools were not visited at all.

2.8.2 Challenges from district offices

2.8.2.1 Lack of collaboration amongst district officials

Research indicates a lack of collaboration among district officials in supporting schools. Mavuso (2013) found that district officials tend to work in isolation and make input in the process of quality management at two levels, that is school and classroom level and their input is more directed at school than at classroom level. Bantwini and Diko (2011) were also concerned about the knowledge gap regarding how district officials collaborate. There is no direct link between what is happening at classroom level and district officials. For effective functionality of schools, there has to be collaboration between subject advisors and principals as well as teachers. Collaboration has been identified as a powerful tool to improve outcomes for all learners (Louw & Wium, 2015).

Altun and Yildiz (2011) indicate that school improvement includes collaborative activities that are aimed to develop teachers, staff, school environment and physical conditions in addition to student achievement. However, Naicker and Mestry (2015) found collaboration between principals collectively and district officials was lacking. Treslan (2005) argues that fostering of collective action is the very essence of collaborative supervision which is premised on participation by perceived equals in the making of instructional decisions. He adds that those in supervisory positions should remember that collaboration is both an attitude and a repertoire of behaviours, where the outcome becomes a mutual plan of action. Since teachers are professionals, it would be prudent for any supervisory assistance to emphasize collaboration and be as non-directive as possible. In so doing, teachers can acquire increased classroom control over decisions essential to them and their students.

2.8.3 Challenges from subject advisors

2.8.3.1 Legacy of past inspection methods

Over the years, school inspectors have tended to exhibit negative attitudes towards inspection and a lack of commitment to their responsibilities. Sergiovanni and Starratt (2002) indicate that supervision used to be carried out in order to eliminate present or possible failures in the education system, to determine whether educational workers are mastering their professional duties and responsibilities and to prevent educational workers doing wrong. However, today as an education sub-system that focuses on improving the process, priority is placed on the strong cooperation between the supervisor and the supervised (Memduhoğlu, 2012). Due to some negativity associated with school inspection in the past the conceptualization of school inspection over the years has undergone radical changes nationally and internationally (London, 2004).

Despite changing the title of school inspector to supervisor in Kenya and possibly in other countries, some officials still play the role of inspectors by harassing teachers and engaging in fault finding. This creates negativity, reduces credibility, leads to poor performance in service delivery and lowers the existing standards. Hoerr (2008) asserts that inspection practices of the early 1900s still linger on in many schools. Though district offices are mandated to enhance the quality of education, thereby improving learner results, research in a South African case shows that there is no significant positive change on the quality of learner education outcomes especially in rural schools (Spaull, 2013). Many teachers described the current role of the curriculum (subject) advisors demanded unnecessary administrative tasks and ‘box ticking’ by teachers. In a study conducted in the Eastern Cape, teachers considered the role and job description of the curriculum advisor to be mainly centered on their immediate teaching needs (Adendorff & Moodley, 2014).

2.8.3.2 Attitude of subject advisors

Instructional supervision deals with human beings, therefore it requires a conducive environment for teachers to improve areas of weakness and uphold good instructional practices. Supervision is a formally designated behaviour system that interacts with the teacher behaviour system in order to improve the probability that the goals of teaching will be achieved (Orenaiya, Adenowo, Aroyeun & Odusoga, 2014). When subject advisors visit schools, they perform classroom observation, which many teachers do not like. If classroom observations are to be effectively used for professional development of teachers, the basic step should be the establishment of a congenial relationship between subject advisors and teachers, as observation must be built on a foundation of trust (Lasagabaster & Sierra, 2011). Fielding (2012) indicates that one of the most important factors which affect the effectiveness of supervision is the unclassified, ambivalent relationship of teachers and supervisors.

The need to build a climate of trust has been widely acknowledged (Aubusson, Steele, Dinham & Brady, 2007). Orenaiya, Adenowo, Aroyeun and Odusoga (2014) suggest that co-operative attitudes and behaviours must be established between the teachers and education supervisors for achieving positive results whether by an individual, group or organization. Enaigbe (2009) indicates that opportunities for meaningful dialogue between inspectors, especially after inspection, are limited. If the attitude of the supervisors contradicts this aim, then supervision will be fruitless. A successful supervisor has a positive attitude (Tesema, 2014). When the supervisors’ attitude towards work and their school is positive, the teachers are more likely to be satisfied with and interested in their work. Furthermore, the heads of the school and staff members alike prefer working with someone who has a positive attitude (Samuel, 2006).

2.8.3.3 Inadequate support for teachers

A challenges to school inspection is inadequate supervision. Inadequate supervision results in teachers' inability to demonstrate adequate knowledge and understanding of the structure, function and development of their disciplines (Ololube, 2014). Enaigbe (2009) indicates that school inspectors have the tendency to focus on school buildings and administrative systems rather than on teaching and learning. This results in minimal attention being paid to the identification and improvement of educational standards. Ololube (2013) found that in Nigeria the present system is control-oriented rather than service-oriented and tends to focus on maintaining the status quo by regulating institutional functions and by ensuring that bureaucratic rules and regulations are adhered to. Another study conducted by Orenaiya, Adenowo, Aroyeun and Odusoga (2014) in Nigeria indicates that the positional status of school inspectors has restricted them to higher administrative officers who are routinely required to visit secondary schools to collect administrative data. They add that most inspectors use their office title to create fear in the minds of teachers through their actions, thus they are more occupied with the office and title of inspectors than with effective supervision.

In South Africa Dilotsothle, Smit and Vreken, (2001) found that the practice of school inspectorates or school advisory services is, to a large extent, top-down in its implementation and management. They maintain that this approach is largely about compliance with departmental regulations rather than engaging with educators about their work. Their research findings support other research done outside South Africa that the focus of the curriculum advisory service (CAS) is on management rather than on curriculum issues related to subject content, teaching or learning. De Clercq and Shalem, (2012) also established that follow-up district work was ineffectual as it was more about monitoring teachers for compliance rather than to support them.

2.8.3.4 Consistency of support for teachers

Monitoring and evaluation of learning should be a continuous process to ensure schools meet their targets. Each district should have mechanisms for monitoring on a continuous basis the performance of both teachers and students for early remedial action when needed (Kimbui, 2012). Orenaiya, Adenowo, Aroyeun and Odusoga (2014) concede that supervision is a continuous activity of monitoring instructional processes and provision of guidance services while establishing two-way communication in a collaborative relationship to improve academic performance of students. Moswela (2010) argues that instructional supervision should be an integral part of the curriculum so that it is a continuous and developmental process to support teachers' demand for collegial instructional systems. Donkoh and Dwamena (2014) indicate that it is very important for teaching and learning procedures to be constantly monitored and reviewed to ensure the total achievement of the objectives.

The HRDC report (2014) indicated that curriculum support lacks consistency; programs are started and then discarded and educators are unable to keep track. The lack of school inspection in Nigeria was cited as a major concern (Wanzare, 2002; Enaigbe, 2009). The DoBE (2011c) mentions unclear role descriptions for subject advisors and inconsistent support. In South Africa, the role of subject advisors differs from province to province. Most educators and principals indicated that they received support from districts, but the nature and quality of the support varied considerably within districts (HRDC, 2014).

2.8.3.5 Lack of feedback to teachers

Quality of the school inspection reports and feedback mechanisms with clear language facilitate the credibility and acceptance of school inspectors' advice to the teachers.

Teachers' willingness to act upon school inspection reports will depend on the relevance of the school inspection comments (Chapman, 2001). If school inspection reports are not properly organized and do not possess constructive advice, it may be difficult for the teachers to make use of the recommendations (Matete, 2009). Productive feedback and follow-up initiatives are lacking in the inspection system. There is thus little opportunity for discussing findings such as the need for more in-service training of teachers and whether new initiatives satisfy the identified need. Given this lack of follow-up, there is no way to ensure that inspection will contribute to school development in a cost effective way.

The lack of feedback from inspectors frustrates teachers and their efforts to improve. The World Bank (2010) indicates that in many education systems worldwide, schools are required to submit information on which they receive virtually no feedback. This does not help schools since underperformance and poor teaching practices may continue. If feedback is provided, then the system can improve. In both England and the Netherlands, external supervision reports also include the contextualization of student outcome results, so that schools can see how they are faring among their peers or other schools with similar characteristics. Although subject advisors conduct teacher development workshops, principals also mentioned that there was no follow to determine the impact the training had on the classroom performance (Nasser, Kidd, Burns & Campbell, 2013).

2.8.4 Involvement of school principals in curriculum matters

The issue of curriculum support by school principals is of concern for many countries. Empirical evidence generally affirms that school principals play a vital role in monitoring teaching and learning for learner success. The school and its organizational management correlate to the academic achievement of the students (Olaleye, 2013). Chemutai (2015) acknowledges that principals should regard instructional supervision as part of their responsibility rather than waiting only for inspectors to play this role. De Grauwe (2001) concedes that in the absence of other supervision structures, the responsibility for guiding and supporting new and often poorly trained teachers may fall to the school principal. Chemutai (2015) indicates that school supervision is assigned to district supervisors who are removed from the school context and visit the school only intermittently or not at all, instead of it being predominantly the responsibility of school principals who are most aware of teachers' pedagogical skills.

The head of school is the only one who resides in the school and is in constant touch with the teachers (Moyo, 2014). The principal is the person who is on the ground and knows more about the teachers he/she is working with. The people who are sent by the ministry (subject advisors) to supervise the teachers and scrutinize their work once in a while might create a problem because after every visit principals are expected to take the advice of the supervisor and implement it. This may be a challenge because what is observed by the supervisor within a short period of time may not be a true picture of a situation known by the principal observing it daily. Most teachers stated that their heads did not make follow up visits to help teachers who had challenges with their teaching activities (Ncube, Tshabalala, Muranda & Mapolisa, 2015). According to Ogunu (2005), secondary school principals are so weighed down by routine administrative burdens that they hardly find time to visit the classroom and observe who the teachers are teaching.

The majority of South African principals does not regard the oversight of curriculum and teaching as their main task, but feel that responsibility for this lies with subject heads and HODs. As a result, they do not spend the majority of their time on aspects of instructional leadership but rather on administrative duties and learner discipline (Hoadley, Christie & Ward, 2009). Principals must oversee the equitable allocation and distribution of work among teachers and must ensure that teachers are allocated subjects and class grades in accordance with their qualifications and experience. Failure to match teachers' allocated work to their qualifications and experience tends to impact negatively on their confidence and morale, and also engenders resistance (Mafora & Phorabatho, 2013).

Archibong (2010) argues that principals act as catalysts to facilitate the implementation of the various sets of instructional activities geared towards an effective, viable, vibrant and qualitative education system that will improve teaching and learning. Principals should devise strategies such as the old students' associations and organize communal fundraisers to help equip schools for retention and delivery of quality education. Waweru and Orodho (2014) indicate that a secondary school principal should endeavour to provide the best school climate to entice students to complete schooling by making the school free from violence, threats, intimidations, hatred and witch-hunting and by developing rich co-curriculum implementation and remedial interventions for slow learners to avoid repetition, frustration and dropout.

According to Mobegi, Ondigi and Oburu, (2010), principals should take up their roles as quality assurance officers in their schools and ensure that there is adequate departmental supervision. Principals should also be more involved in the educational decision-making process and should be trained to provide better quality of education (Almannie, 2015). Continuous curriculum changes have affected teacher confidence and motivation hence it becomes the function of principals to ensure that the morale of the teachers is uplifted so as to enable their work to be carried out with enthusiastic interest which in turn will boost the performance of different individuals in their different tasks (Chemutai, 2015). The principal possesses greater information about the school system and about instructional and management strategies that can strengthen the teachers' capacity to cope with classroom problems and thereby ensure adequate and effective learning on the part of learners (Oyewole & Ehinola, 2014).

In some parts in the world greater success is achieved. In Bangladesh, head teachers treat the learners' achievement as their ultimate goal; they work under pressure using their skills to handle different adverse situations in school to improve the teaching and learning process (Ali, 2011). In Zimbabwe, the principal is at the epicenter of supervision of teachers with other officers merely complementing their efforts (Mlilo, 2010). The school principal oversees teaching and learning in the school to ensure that quality instruction takes place. If educational managers (subject advisors) are to reinforce learner performance, the senior manager (school principals) should be accessible and available for guidance during the implementation of the strategic change (Motaung, 2011). The DoBE director generals's presentation on Radical Socioeconomic Transformation emphasized the need for principals to be involved in curriculum matters. He said: "Principals need to provide leadership on the curriculum, as well as administration and management" (DoBE, 2017b: slide 5).

2.8.5 Challenges with Physical Science teachers

There are many negative opinions of teachers in the literature regarding supervision. For example, educational supervisors displaying unpleasant behaviour during the supervision (Kazak, 2013), a lack of standards for supervision implementations (Aksit, 2006), the anxiety that supervision causes teachers (Can, 2004), non-objective behaviours during supervision (Balci, Aydin, Yilmaz, Memduhoglu & Apaydin, 2007), insufficient levels of guidance services (Memduhoglu & Taymur, 2014), low levels of professional competency of supervisors (Kudisch, Fortunato & Smith, 2006) and many more can be listed. A study conducted in Nigeria revealed that a growing body of evidence suggests that schools can make a great difference in terms of students' academic performance and a substantial portion of that difference is attributable to teachers, thus there should be a link between teacher behavioural traits, teacher competence, and teacher productivity and students' academic performance (Fehintola, 2014).

This implies that good comments by supervisors during the supervision process have a measurable bearing in improving the teacher performance in the teaching and learning process. Factors investigated that have an impact on the teaching of Physical Science of teachers were: content and pedagogical content knowledge, professional learning opportunities, teachers' qualifications, teachers' competence, attitude and interest of Physical Science teachers in the subject.

2.8.5.1 Teachers' content and pedagogical content knowledge

Teachers' content and pedagogical content knowledge entails subject specialization, that is, knowledge of the discipline that a teacher is qualified to teach. A teacher needs to know facts and concepts central to the discipline but also the conceptual structure and the way ideas have been developed by experts who research the discipline. Winch (2010) refers to this as discipline knowledge. Guerriero (2016) explains pedagogical knowledge as specialized knowledge of teachers for creating effective teaching and learning environments for all students. International and local researchers agree that content and pedagogical content knowledge is necessary but emphasize that it is not sufficient (De Clercq & Shalem, 2012).

Underperformance of schools and learners shows that some teachers lack expertise in dealing with all the content areas and this creates knowledge gaps in the learners' achievement of learning objectives (KZN strategy, 2012). Teachers who lack sufficient conceptual understanding of their subject are more likely to employ inappropriately concrete techniques when teaching and use methods that undermine the long-term learning trajectories of learners. A number of recent studies have drawn attention to weak teacher content knowledge (Spaull, 2011) and pedagogical knowledge for most South African teachers and this is a major cause of inadequate learner achievement (Bernstein & Hofmeyr, 2015). Poor subject matter (content and pedagogical and content) knowledge and training (of Physical Science) is usually noted amongst teachers that are in historically disadvantaged school settings (Mkhwanazi, 2013), which is a result of low quality of education received within the historically disadvantaged parts of the South African school system (Van der Berg, Taylor, Gustafsson, Spaull & Armstrong, 2011).Campbell and Chittleboraugh (2014) concede that most teachers possess poor subject matter knowledge and are not adequately equipped to teach in their classrooms due to the legacy of the past education system in South Africa.

The available evidence suggests that the underperforming teachers in South Africa are unaware of their own learning deficits and do not understand the full demands of the curriculum. Kriek and Grayson (2009) found that most Physical Sciences teachers lack the necessary subject content knowledge as well as pedagogical content knowledge. The repercussions are students' lack of interest in Science as argued by Campbell and Chittleboraugh, (2014) which is compounded by many teachers' lack of Science knowledge and concomitant lack of confidence to teach the subject.

Shortcomings in Physical Science content knowledge of teachers remain a serious concern that can be solved by the individual teacher’s own initiative in a variety of ways: answering the NSC papers under simulated examination conditions so that one can fully appreciate the needs of learners in understanding content and examination techniques more effectively; reading more widely on topics by referring to more than one textbook and by following media features to keep up to date with current trends in the subject; and developing and conducting short informal assessment tasks to diagnose content gaps in specific topics (GDE, 2015).

Teachers’ Science content knowledge makes a difference both in their professional practice and in their students’ achievement. It appears to have a number of direct, and sometimes also indirect, influences on classroom practice (Horizon Research Inc., 2010). This has led to the implementation of curriculum reforms, in order to break from previous arrangements and seek to advance critical thinking and problem solving. To improve this, teacher development practices must focus on the improvement in the teaching of the curriculum, which involves ensuring that teachers are well supported in their teaching, by district subject advisors (Ramnarain & Fortus, 2013).

2.8.5.2 Professional learning opportunities of Physical Science teachers

There is need for both subject knowledge and pedagogical knowledge to be strengthened simultaneously (UNESCO, 2012). An effective teacher education program is thus a prerequisite for reliable and resilient education practice which engenders confidence among teachers and students as a result of effective and professionally coordinated learning (Umunadi & Ololube, 2014). The policy imperative for the teaching and learning of 21st century skills, such as problem-solving, collaboration, communication, and creativity, might entail a re-skilling of the current teacher workforce and upgrading of the knowledge base of the teaching profession (Guerriero, 2016). The review in the 2015 Centre for Development Enterprise (CDE) report indicated that the majority of teacher education programs did not meet the minimum standards as set by the review process particularly weakness in practice.

DoHET gave notice that by July 2014, all teacher education programs had to be re-designed, so as to give particular emphasis to what is taught (subject or disciplinary content knowledge), and how it is taught (Pedagogical Content Knowledge), as well as a strong practice teaching component. Motshekga (2011) emphasized the need for the re-training of teachers and adequate teacher support as a key to the successful implementation of this policy document. She added that critical actions that have been identified and which need to be implemented throughout the entire system include the strengthening of monitoring, evaluation and support, especially for teachers (Motshekga, 2013).

New approaches to teaching include those that emphasize high order thinking skills, metacognition, a constructivist approaches to learning and understanding, brain-based learning, co-operative learning strategies, multiple intelligence, and the use of computer-based and other technology that help students to gain access to information independently Kankam (2013). These skills correlate with the aims of Physical Science as stated in the CAPS policy document which states that Physical Sciences promotes knowledge and skills in scientific inquiry and problem solving; the construction and application of scientific and technological knowledge; an understanding of the nature of science and its relationships to technology, society and the environment (DoBE, 2011a).

Cobern, Schuster, Adams and Skjold (2013) argue that the time limitations on typical Science methods courses and professional development programs limit the range of exposure to Science teaching pedagogies. Currently professional learning opportunities available do not enhance teachers' professional knowledge and growth. Learning opportunity for a South African Physical Science teacher is underpinned by the assumption that a major cause of inequalities in learner academic performance is inequalities in content taught and in quality of instruction (Naidoo & Green, 2010). Professional development activities offer opportunities for active learning or opportunities for teachers to become actively engaged in the meaningful analysis of teaching and learning where, for instance, they review students' work or they obtain feedback on their teaching (Nasser, Burns & Campbell, 2013).

Professional learning opportunities for teachers of Science have increasingly focused on deepening teachers' content knowledge (Horizon Research Inc., 2010). Although a notable improvement in the provision of the professional learning opportunities that are supposedly aimed to bring growth in teachers' knowledge of content and teaching practices is seen, the lack of content knowledge and pedagogical content knowledge remains unchanged (Bantwini, 2010). For this reason, Kankam (2013) argues that teachers must be committed to and continually engage in pursuing, upgrading, reviewing of their own professional learning and continuous professional development. Physical Science teachers need to acknowledge their limitations and strive to better themselves professionally. Guerriero (2016) argues that as professionals in their field, teachers can be expected to process and evaluate new knowledge relevant for their core professional practice and to regularly update their knowledge base to improve their practice and to meet new teaching demands.

2.8.5.3 Qualifications of Physical Science teachers

One of the greatest challenges facing the South African education system is the production of sufficient qualified, competent teachers, who can provide quality teaching for all school subjects and phases. The current official requirement for a qualified teacher in South Africa is known as M+4, a matric (school-leaving) certificate plus four years of ITE. Until fairly recently, however, M+3 (matric plus three years of ITE) was the official requirement, and so most teachers in the country are qualified with M+3 (Bernstein & Hofmeyr, 2015). CDE's research produced some noteworthy and surprising findings about the current teaching force. CDE used data on 400 7568 teachers, who were South African citizens between the ages of 22 and 65, to produce the following profile of the South African teaching force in 2013: 81 % were qualified: 66 % had an M+3 qualification;15 % had an M+4; 19 % were unqualified. Some 10 % of teachers had the equivalent of an M+3 qualification but no professional teaching qualification, and about another 10 % had an M+2 or lower.

The quality of most ITE programs leaves a lot to be desired and the result is that most of the current teaching force has been inadequately educated and trained, whether during apartheid or in the recent past. Research conducted in Guinea and India found that teachers trained poorly in evaluation techniques and in instructional methods were not able to gauge individual student learning needs, hence could not produce the desired enhanced students' academic performance (Orodho, 2014). The KZN 2012 strategy emphasizes the need for subject advisors to provide support for the unqualified educators. In providing special programs for unqualified educators, the subject advisory system may close the methodology gap that exists between the qualified and unqualified educators. Teachers need supervision to upgrade them in terms of teaching and learning skills; it will encourage teachers to work harder and not to abscond from schools (Obiweluozor, Momoh & Ogbonnaya, 2013).

The contributing factor to the challenged related to Physical Science teaching qualifications are the discrepancies between the tertiary education subjects and the school subjects. The school curriculum offers Physical Science as a combination of Physics and Chemistry as stipulated in the CAPS document whereas at tertiary institutions student teachers may choose between the two. These differences create a challenge for teachers to produce the expected quality Physical Science results because of their unequal ability to excel in both parts of Physical Science.

2.8.5.4 Competence, attitude and interest of Physical Science teachers

Bernstein and Hofmeyr (2015) argue that a qualified teacher is not necessarily a good teacher. Not all qualified teachers are competent professionals able to provide quality teaching and learning. In some schools in South Africa, teachers are placed in posts that do not correspond with their teaching qualifications or subject specializations (Bernstein & Hofmeyr, 2015). This leads to poor curriculum delivery. Other challenges encountered by supervisors are: unprofessional attitude to work, lack of interest, poor perception of the general public on teaching profession, poor status given by teachers, constant change in educational policies, political instability and lack of an evaluation system (Onasanya, 2011). Canbay and Berecen (2012) also concur that the teachers' conceptions shape their instructional decisions in the classroom. They argue that what teachers do in their classrooms is oriented by their conception of teaching which is derived from their beliefs including a teacher's prior experiences, school practices, and a teacher's individual personality.

The 2015 National Senior Certificate Examination Diagnostic report revealed that the performance of learners in the examination indicates that teachers and learners are still becoming familiar with content in the CAPS, which was implemented for the first time in 2014 in Grade 12. A lack of competence in using and understanding subject-specific terminology and definitions has obvious implications for the ability of candidates to engage with subject content generally and to express their knowledge of the subject, while a lack of understanding of the action verbs used in the questions inevitably leads to inaccurate interpretation of specific questions (GDE, 2015). The implications of this statement are that most teachers are still not competent to effectively implement the CAPS policy document, resulting in the poor performance of learners.

The supervision of curriculum implementation ensures that teachers are following the school curriculum effectively (Ololube, 2014). Low teacher effort is often considered one of the most serious problems in South African schooling, perhaps even bigger than weak teacher content knowledge and pedagogical skills (The Mckinsey report, 2007). Competence may improve the teachers' expertise in his/her field. Literature highlights many characteristics of expert teachers: extensive pedagogical content knowledge, better problem solving strategies, better adaptation for diverse learners, better decision making, better perception of classroom events, greater sensitivity to context, and greater respect for students. In addition to knowledge, professional competence involves skills, attitudes, and motivational variables (Guerriero, 2016).

2.8.5.5 Curriculum reforms

The rapid developments in knowledge, concepts, technology, and philosophies as a result of the rapid change in the world have brought about some fundamental changes in education (Donkoh & Dwamena, 2014). Educational change is associated with education reforms. The term reform implies that the existing status-quo in the education sector is unsatisfactory. Reform therefore could be conceived as the improvement or amendment of what is wrong, undesirable or unsatisfactory in a system (Nwangwa & Omotere, 2013). International evidence suggests that the progress of educational reforms depends on teachers' individual and collective capacity and how the reforms link with the school-wide capacity for promoting learners' learning (Stoll, Bolam, McMahon, Wallace & Thomas, 2006).

In South Africa, as in other countries, educational reforms are intended to redress past racial inequalities as well as combat current skills shortages in areas like Physical Science. Some reforms have been triggered by the evaluation results of TIMSS, while others result from a general lack of satisfaction with learner performance. Curriculum reform may also be introduced with the goal of producing scientifically literate citizens capable of competing nationally and internationally and contributing towards the national economic growth (Bantwini, 2010). Frequent curriculum changes were major concerns of most interviewed teachers in a Tanzanian study. Many complained about frequent curriculum changes without proper teacher preparation on how to manage and handle such changes (Matete, 2009). Roehrig and Kruse, (2005) argue for the need to address teachers' content knowledge in the implementation of reform-based curriculum.

Chisholm and Leyendecker (2008) examined the gaps between policy and practice in curriculum change and found that, while there is agreement on the aims of reform, there is evidence of divergence in practice. They argue that in practice ideas are contextualized and displaced, and often fail to meet social development goals. South African school improvement literature continues to show that districts and their officials hardly give sufficient attention to their role in the curriculum reform process, creating deficiencies in their comprehension of the struggles confronting the new policy implementation. Recent changes in the South Africa education system have created challenges for educational managers who need to improve their ways of performing their functions in enhancing teaching and learning (Milondzo & Malatji, 2015).

Challenges such as curriculum change have impacted negatively on learner performance (Chauke, 2010). Massell, (2000) adds that district officials play an essential role in ensuring the success of new mandates and reforms filtered by the government as they strongly influence the strategic choices that schools make to improve teaching and learning. While in South Africa most of the teacher professional development models are yet to address teachers' content and pedagogical content knowledge, strong demands are placed on teachers to update their knowledge and teaching skills continuously due to the introduction of a new curriculum or changes in learner characteristics and learning needs (Lew, Cho, Koh & Paek, 2012).

Current research on teacher professional development, although diverse, points to the need to implement sustainable education system reform through teacher change to improve the quality of teaching and, by extension, to improve learner achievement (Pop, Dixon, & Grove, 2010). Oyewole and Ehinola, (2014) add that regular and continuous supervision is urgently needed especially in view of change in the school curriculum. Mabogoane, (2006) advise that educational reform needs to focus the efforts of teachers to enhance the effectiveness of learning among learners.

2.8.5.6 Learners with learning barriers

The Education White Paper 6 advocates the inclusion of learners with disabilities in the South African education system. In recent years, the practice of inclusive education has been widely embraced as an ideal model for education, both in South Africa and internationally (Maher, 2009). However, this acceptance of ideal practices does not necessarily translate into what actually occurs within the classroom. Successful inclusion depends on the investment of other school personnel as they create the school culture and have the ability to challenge or support inclusion (Ainscow, 2002). Research has found that although teachers often report that they agree with the idea of inclusion, they actually believe that the needs of learners with disabilities are best met in separate classrooms (Campbell, Gilmore & Cuskelly, 2003).

In South Africa, up to 70% of children at school-going age with disabilities are out of school. Of those who do attend, most are still in separate 'special' schools for learners with disabilities. This situation prevails despite the push for the educational inclusion of learners with disabilities (Donohue & Bornman, 2014). New inclusive policies have demanded from teachers to challenge their existing schemas about best practices in the education of learners with disabilities (Oswald & Swart, 2011). According to Bornman and Rose (2010:7), "a general lack of support and resources, as well as the prevailing negative attitudes toward disability, all contribute to the general bewilderment in South African schools towards inclusion."

Contemporary teacher education in South Africa trains teachers how to accommodate diverse learners in a single classroom (Oswald & Swart, 2011). Support is a necessary component of successful inclusive education practices as the needs of many learners with disabilities are beyond the basic services available in typical general education classes (Lomofsky & Lazarus, 2001). Support provisions depend on the particular learner's impairment and may include special equipment, educational provisions and accommodations, such as, more time during test assessments, a teacher's aide to help provide the learner with a more intensive disability and one-on-one instruction. To successfully implement inclusion anywhere in the world, educators must have adequate training, sufficient support, and positive attitudes (Frankel, Gold, & Ajodhia-Andrews, 2010).

Teachers' attitudes toward inclusion might become more positive if, along with training, they were to receive the appropriate service support for their learners with disabilities. One of the strategies suggested by the Education White Paper 6 for establishing an inclusive education system is to establish district-based support teams to help support educators with the process of implementing inclusive practices in their classrooms. However research found that education officials in South Africa were unsure regarding the goals of inclusive education, with some officials reporting they were unclear about how ordinary and special schools would be transformed into schools more suitable for inclusive education (Stofile, 2008). Effective and clear legislation has been a primary means by which other countries (e.g., the US) have established and supported inclusive practices (Frankel, Gold & Ajodhia-Andrews, 2010).

An important goal for Science teacher education is to acquire knowledge of Science teaching pedagogy (Cobern, Schuster, Adams & Skjold, 2013). In order to achieve curriculum excellence, Physical Science subject advisors require the competencies, skills and knowledge associated with their roles and responsibilities. All training and development programs organized for teachers by subject advisors should be geared towards improving the quality of teaching and learning and eventually learner performance (DoBE, 2011b). South African district officials' perspectives are seldom heard, yet they constitute nuggets of knowledge that play a critical role in the implementation of new curriculum policies (Bantwini & Diko, 2011). To achieve the goal for effective support for Physical Science teachers, Physical Science subject advisors need to possess qualities worthy of the task.

2.9 EFFECTIVE CURRICULUM SUPPORT

School inspection has an impact on teaching and learning (Matete, 2009). Effective supervision occurs when the supervisee consolidates an identity separate from the supervisor, while acknowledging the supervisor's importance and the learning that occurs through supervision (Olulube & Major, 2014). Obiweluozor, Momoh and Ogbonnaya, 2013) indicate that supervision should be used as a form of reinforcement. They add that if teachers find out that supervision and inspection are more formalities than quality control, they will not be encouraged to improve performance. Wansare (2002) argues that inspection is concerned with the improvement of standards and quality of education and should be an integral part of a school improvement program. For the quality of education to be enhanced by subject advisory, supervisees must demonstrate an openness and commitment to the process, along with a strong sense of self-motivation and self-improvement (Ani, 2007).

Supervision is defined as a relationship between senior and junior member(s) of a profession that is evaluative, extends over time, serves to enhance the skills of the junior person, and monitors the quality of the services offered by the junior person, and acts as gate keeping to the profession (Bernard & Goodyear, 2004). If this is not the case, then supervision or subject advisory gets reduced to mere control instead of support. Win (2010) explains control as a process to find out deviations between planned performance and actual performance and to suggest corrective measures or actions, whereas support is in most cases characterized by advice given to teachers by their supervisors. If inspections are not done effectively, if communication and feedback is lacking, if there is no follow up on recommendations, and if there is no way of assessing whether inspections deliver or not, then school inspections are a waste of public resources and time (Kambuga & Dadi, 2015).

Holland and Adams (2002) contend that when administrators and supervisors work with things and ideas rather than with people in pursuing school goals, they tend to be operating in an administrative way rather than a supervisory way. Effective supervision affects the quality of teaching by teachers (Ncube, Tshabalala, Muranda & Maples, 2015). Wilkinson (2010) maintains that supervision will go a long way to improve performance, if it is conducted in a manner which shows direction and development rather than judgment and criticism. Obiweluozor, Momoh and Ogbonnaya (2013) state the following basic principles for effective supervision:

1. There should be a healthy atmosphere free from pressure and stress.
2. Staff must be given orientation about the quality of work expected from them and new staff must be given orientation concerning the job.
3. There should be room for constructive criticism, that is poor work should be criticized, advice should be given to the affected party.
4. Staff should be given opportunity to prove their capability; they should be allowed to use their initiative when performing certain task or taking decision in some crucial areas.
5. Staff should be motivated and encouraged to work, to increase their productivity that will enhance organizational goals.

2.10 PERCEPTION OF TEACHERS ABOUT SUBJECT ADVISORS

Teachers have mixed views of the value of district support in improving the quality of teaching and learning. This seems to be related to district capacity and the ability of subject advisors to support schools appropriately (HRDC, 2014). Although formal observation and feedback are integral to improving teaching performance and practice

(Jonson, 2008), many professionals express anxiety when it comes to classroom observation, as observers in many parts of the world tend to exercise top-down authority (Li, 2009). Aubusson, Steele, Dinham and Brady (2007) agree that many teachers dislike and even fear being observed, as they find classroom observation stressful and intimidating. Madziyire (2010) adds that most teachers are apprehensive about being supervised; as a result teachers do not perceive supervision as a worthwhile activity.

Kruger (2003) argues that teachers usually associate instructional supervision with rating of teachers. In a study by Matete (2009), 8% of teachers indicated that school inspectors do not help them to teach better as difficult topics are left without any support. However most teachers indicated that they received support from districts, but the nature and quality of the support varied considerably within districts. Teachers admitted that school inspection is very important; people by their very nature, tend to forget things and sometimes they need the encouragement to enable them perform to the desired standards. The majority of teachers admitted that school inspectors provide professional support. Some agree that subject advisors offer advice on how to help the individual learners in the classroom and how to make or prepare the schemes of work and lesson plans based on the level of the learners. Supervisors also provided advice about how to use the teaching and learning materials (Matete, 2009).

In a study conducted in Portugal by De Nazaré Castro (2013), teachers agreed that supervision allows for professional growth, improving their performance and the quality of teaching-learning practices. They felt that the supervisor should promote reflection on practices among peers and in the educational community, so as to promote a socio-constructivist process of professional development. In a Tanzanian study, teachers found the guidance given by school inspectors contributed towards professional development and keeping them up-date with curriculum changes (Barrett, 2005).

2.11 CONCLUSION

The issue of school inspection is a fairly complex issue that needs the creation and establishment of a positive relationship between school inspectors and teachers. It is this relationship that may facilitate and enhance communication, so that school inspections can positively influence the teaching and learning process (Matete, 2009). Despite challenges with subject advisory, Ehren and Visscher (2008) indicate that the management role of curriculum advisor is an essential part of the teaching establishment, and as such, teachers have to accept and live with it. Teachers must be willing to listen to the suggestions and implement the recommendations (Chapman, 2001). Almanac (2015) concedes that teachers should realize the importance of stakeholders' involvement in education and value their ideas and contributions. Jahanian and Ebrahimi (2013) acknowledge that nowadays, educational leaders cooperate with teachers to promote of quality of teachers' performance and reduce their problems through professional cooperation.

The next chapter focuses on the research design.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This study seeks to investigate through a mixed method study, the role of Physical Science subject advisors in improving the quality of the teaching of Physical Science in the further education and training (FET) phase (Grade 10-12). Annual learner performance in Physical Science has become a disturbing issue for South Africa when compared to other countries based on the TIMSSS results since 2002. Learner performance in Physical Science depends on many factors starting from curriculum implementation supported by subject advisors to school managers, school teachers and ultimately to the learners. In order to establish measures that can be taken to improve the quality of the Physical Science results, the writer considered the DoBE's intervention strategy to strengthen the support for Physical Science teachers which may have an impact on the performance by learners.

Good quality performance by learners in Physical science throughout the FET phase (Grade 10-12) implies quality pedagogical content knowledge, sufficient content knowledge and quality assessment practices by teachers which stems from sufficient support and development by subject advisors. This traces back to support and development of subject advisors by the Deputy Chief Education Specialist for Physical Science in the provincial office and seldom other managers at the district offices like cluster leaders and the district directors. Proper support and development by subject advisors may also imply that the roles of subject advisors are clearly understood and correctly implemented by subject advisors as curriculum supporters specifically in the content of the subject and not by generic managers from district offices.

Poor performance by learners suggests limitations in teachers' content knowledge and pedagogical content knowledge, poor quality assessment practices, lack of support and development by subject advisors, and misunderstood or undefined roles of subject advisors. Subject advisors are the direct link between teachers at schools, the provincial departments of education and the subject accounting officers at the DoBE. As a result this study focused on their roles, what they do, how they do it and the impact of their roles in the teaching and performance of Physical Science at schools.

The study seeks to answer the following primary question:

What is the role played by subject advisors in improving the quality of the teaching of Physical Science in the FET phase?

The study used quantitative and qualitative data to answer the following secondary questions

- Do the Physical Science subject advisors perceive their role at schools as significant in improving the quality of Physical Science teaching?
- Do the Physical Science subject advisors have sufficient Physical Science content and pedagogical content knowledge to assist teachers to improve the quality of the teaching of Physical Science in the FET phase (Grade 10-12)?
- What curriculum and management skills do Physical Science subject advisors possess to enhancing the quality of the teaching of Physical Science in the FET phase (Grade 10-12)?
- How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?

This chapter presents the research design, research site, population, sampling, data collection procedures, ethical considerations and limitations to the study.

3.2 RESEARCH DESIGN

Yin (2003) defines a research design as a logical plan for getting from here to there, where *here* may be defined as the initial set of questions to be answered, and *there* is some set of conclusions (answers) about these questions. This study investigates roles of subject advisors in improving the quality of Physical Science teaching in school and requires rich data to address the research question fairly. Mixed method design (Creswell, 2005) was used as a procedure for collecting, analysing and mixing or integrating both quantitative and qualitative strategies for the purpose of gaining a better understanding of the research problem. Johnson and Onwuegbuzie (2004) define mixed methods research as the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study. They add that this type of research attempts to legitimate the use of multiple approaches in answering research questions, rather than restricting or constraining researchers' choices (i.e., it rejects dogmatism).

A study in an education study is vast because of the richness of data that can be obtained from documents that regulates an education system, processes in place as well as experiential knowledge of those who are part of the system. O'Cathain, Murphy and Nichol, (2007) emphasize that a mixed methods study has the potential to produce knowledge that is unavailable independently, and that it can produce knowledge that is unavailable to other approaches through the creation of a wider picture, more confidence and a wider variety of views. The study on the roles of subject advisors has an effect on impact on the performance of learners which involves the participation of national and provincial education managers, teachers at school and the curriculum. Quantitative and qualitative data was collected from provincial, district and school stakeholders, the idea being that it can be more fruitful to consider how the strengths of each can be combined within a mixed approach (Lopez-Fernandez and Molina-Arozin, 2011).

Integrating quantitative and qualitative data can enhance the value of mixed methods research (Bryman 2006; Creswell & Plano Clark, 2011). Data collected incorporated the methodology of leadership of Physical Science though available documents for education leadership, questionnaires and interviews. The path goal theory which incorporates the subject leadership (section 2.1.1) of subject advisors through guiding, supporting and helping teachers and the facilitative theory which focused on the issues pertaining to curriculum management and skills required to acquire the required knowledge of Physical Science (Sections 2.5) collected from available documents and participants. This enriched and improved an understanding of the matters under study and fostered fresh ideas about them in order to give answers to questions that are difficult to answer by a sole classical method (quantitative or qualitative). It provided a better understanding of research problems that neither of each method could provide on its own (Creswell & Plano Clark, 2011).

Johnson and Onwuegbuzie (2004) consider a mixed method approach as an expansive, creative and non-limiting form of research, inclusive, pluralistic, and complementary, which suggests that researchers take an eclectic approach to method selection and the thinking about and conduct of research. Data collection instruments were used to collect similar information about Physical Science subject advisors from different participants to compare responses which assisted in data analysis and triangulation. Research variables in a mixed method do not necessarily have clear cut meanings; processes that can be revealed through numeric analysis as well as through narratives. Whereas there were cases where numeric analysis were considered as valuable data such as the perfomance of Physical Science results in the districts, these were reinforced with questionnaites for the interviews to observe a relationship between these variables and to use the combined data to draw conclussions.

Leech and Onwuegbuzie (2009) categorize mixed methods in three dimensional typologies: as a function of the level of mixing, time orientation, and emphasis of approaches. Level of mixing refers to whether the mixed research is fully mixed or partially mixed, this implies whether the utilization of qualitative method exceeds that of quantitative method or vice versa. Time orientation pertains to whether the quantitative and qualitative phases of the research study occur concurrently or sequentially. Emphasis of approach pertains to whether the quantitative and qualitative components of the study have approximately equal emphasis regarding addressing the research question or whether one component has relatively higher priority than does the other.

The list below summarizes four mixed method typologies as presented by Johnson and Onwuegbuzie (2004).

1. Equal weight, simultaneous: QUAL+QUAN.
2. Equal weight, sequential: QUAL→QUAN; QUAN→QUAL.
3. Different weight, simultaneous: QUAL + quan; QUAN + qual.
4. Different weight, sequential: qual→QUAN; QUAL→quan; quan→QUAL; QUAN→qual.

Johnson and Onwuegbuzie (2004) advise users of a mixed research method to decide prior to the data collection on whether one wants to operate largely within one dominant paradigm or not, and whether one wants to conduct the phases concurrently or sequentially. Fetter, Curry and Creswell, (2013) expanded the fourth typology and categorized them as exploratory sequential; explanatory sequential; and convergent designs. The explanatory sequential design (quan→QUAL) was chosen for the study and followed a procedure of first collecting quantitative data and then collecting qualitative data to help explain or elaborate on the quantitative results (Creswell & Plano Clark, 2011).

To validate data collected, quantitative data and qualitative data were triangulated in order to draw conclusions. Cohen, Manion and Morrison (2007) describe triangulation as the use of two or more methods of data collection in the study of some aspect of human behaviour. Quantitative data and qualitative explained more fully, the richness and complexity of human behaviour involved in the management of Physical Science by subject advisors through responses of participants who are actively involved in the teaching or management of the subject as well. Methodological triangulation was used to combine data collected from questionnaires, individual interview and group interviews conducted at focus groups (PLC's).

In addition where required, data collected from participants was compared with available data such as analyzed results and documented roles of subject advisors. All available data was then combined and compared to draw conclusions and final reports for the study, which assisted in making recommendations for improvements in the South African education system, particularly in improving the teaching and learning of Physical Science.

Figure 3.1 below illustrates the sequential mixed method for this study.

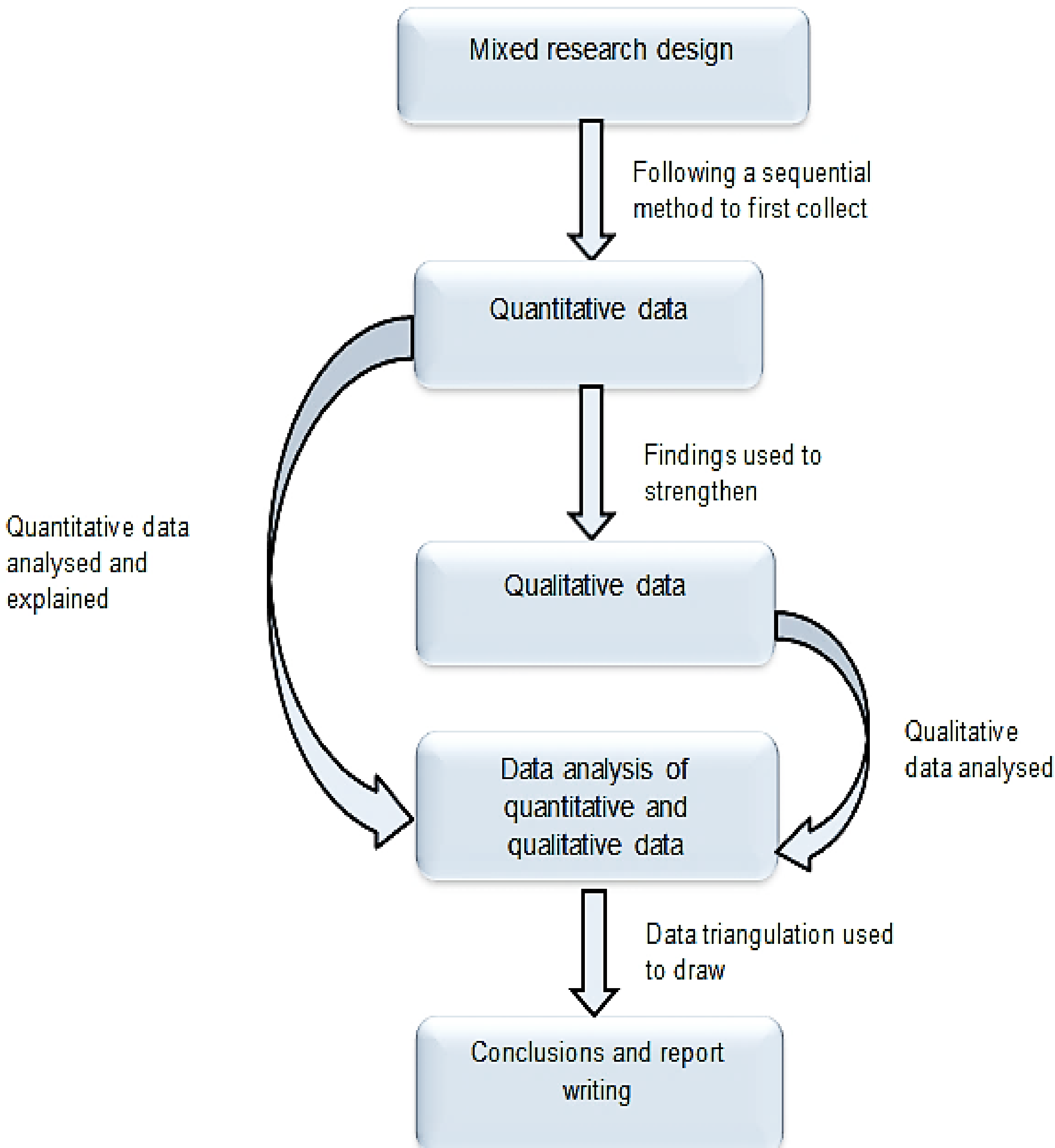

Figure 3.1: The sequential mixed method design

(Adapted from Subedi, 2016)

3.3 RESEARCH SITE

A research site is a place in which the research study occurs (Maree, 2007). The research site for this study was an education region in one South African province. The education region comprises of four districts that are situated in the same Municipality with almost the same physical resources and the same human resources for Physical Sciences (i.e., two subject advisors). They have a large number of schools in townships, a sizeable number of former model C schools and a small number of independent schools. The researcher also works in one of the districts, which facilitated data collection since the participants were easily accessible, that is, subject advisors, school principals and Physical Science teachers. The district offices and schools are all in the same metro and in the same education region, so data collected would easily be comparable.

3.4 POPULATION

A population (McMillan & Schumacher, 2010) is a group of elements or cases, whether individuals, objects or events, that conform to specific criteria and to which the researcher intends to generalize the results of the research. The population used for this study was a Physical Science provincial DCES, eight (8) Physical Science subject advisors, two hundred and twelve (212) school principals and four hundred and twenty-two (422) Physical Science teachers.

3.5 SAMPLING

A sample is a small group of subjects or participants from whom data is collected (McMillan & Schumacher, 2010). Leech and Onwuegbuzie (2010) emphasize the importance of specifying a sample size for all qualitative and quantitative phases in a mixed research. The criterion of the sample for this study was established before entering the field (Charmaz, 2014). Onwuegbuzie and Collins (2007) formulated a sampling model for mixed method research which provides a typology in which mixed research sampling designs can be classified according to (a) the time orientation of the components (i.e., whether the qualitative and quantitative phases occur concurrently or sequentially) and (b) the relationship of the qualitative and quantitative samples (i.e., identical vs. parallel vs. nested vs. multilevel).

The sequential mixed research design prompted the choice of an identical relationship typology for this study where exactly the same participants were involved in both the qualitative and quantitative phases of the study, hence data collected through questionnaires and individual interviews were done with the same participants. Since the research followed a mixed method design, convenience sampling was used to collect quantitative data and purposive sampling was used to collect qualitative data. Maree (2007) describes convenience sampling as used to select individuals who are available and willing to participate in the study to collect data. The advice of Patton (2002) to researchers about purposive sampling is that they must first state the selection criteria for choosing the people or site for the study.

Patton (2015) adds that purposive sampling in qualitative data collection has the power and the logic to select information rich cases for in-depth study and that its use can assist the researcher to learn a great deal about the issue of central importance to the purpose of the inquiry. Data collection was predominantly done through interviews for all participants and focus groups. Van Manen (2014) adds that purposive sampling is used to select interviewees or participants on the basis of their knowledge and verbal eloquence to describe a group or sub-culture to which they belong. All sampled participants were chosen based on the active role in Physical Science teaching hence the anticipated richness and relevance of information in relation to the study's research questions pertaining to the quality of Physical Science teaching (Yin, 2011).

The samples for this study were: the Physical Science provincial DCES, one Physical Science subject advisors each from the four districts, one principal each from the four districts, two Physical Science teachers from two bigger districts and one each from two smaller districts; and four PLC groups each from the four districts. All sampled participants work in the same geographic area which made it easy for data collection and replacement of participants who lost interest in the study. The same sample was used for all data collection procedures through all phases.

The choice of the provincial DCES was based on his/her role as the accounting officer for the performance of Physical Sciences in a province and his/ her responsibility to develop the Physical Sciences subject advisors as the first line manager between subject advisors and the curriculum managers at the education department. The principals were sampled because of their management roles at schools as accounting officers for the performance of Physical Sciences within a school. Physical Science teacher are responsible for effective teaching and assessment and interact with learners daily but require the support of Physical Science subject advisors to improve teaching practices. Their involvement in the study would provide the most accurate data on the support received. Focus group of Physical Science teachers (PLC) were added to enhance data required given that since the study was done in one district, it would be beneficial to get more data from a larger group in each district.

3.6 DATA COLLECTION PROCEDURES

Data collection involved gathering information about the variables in the study (McMillan & Schumacher, 2010:130). These variables included: where data would be collected, when it would be collected, by whom, and necessary specifics of the experiment (McMillan & Schumacher, 2010:133). Data collection procedures entailed gaining access to the research site, presentation to site, designing data collection instruments, conducting a pilot study and collection of data.

3.6.1 Gaining access

Data for every study should only resume after permission to conduct research in a particular community is granted (De Vos, Strydom, Fouche & Delport, 2002). Permission may be sought at different levels of the organization in which the research is to be conducted (Hennink, Hutter & Bailey, 2011). The overt access method was used to gain permission to conduct the study from the provincial education office gatekeepers (Denzin & Lincoln, 2000). Data for this study was required from the provincial education office, district offices and public schools therefore application for permission to conduct the study was done by completing a research application form provided by the relevant provincial education office, together with samples of permission letters and participation sheets which would be submitted to other participants. When an approval letter (Annexure B) and an ethical clearance were granted (Annexure C), permission was requested from the Physical Science provincial DCES, then district directors, subject advisors, school principals and Physical Science teachers of sampled districts.

The purpose of the study, anonymity and freedom to withdraw from the study (McMillan & Schumacher, 2010) were outlined in the permission letters and the participation sheet (Annexures D-H). Participants were give permission letters, approval letters and copies of ethical clearance to go through them before data collection. Verbal permission to conduct focus group interviews was requested first from subject advisors before providing teachers in PLC groups with permission letters. This was done to allow teachers to choose to participate in the focus group without obligation.

After permission was granted, permission to participate in interviews and consent letters were given to willing participants and appointments to start with data collection were made; all willing participants replied to the researcher. A schedule for data collection and information regarding confidentiality of data collected as well as the right of the participants to withdraw from the study were included in the permission letters. See Annexures A - H.

3.6.2 Presentation to the site

Presentation to the site took place after appointments were secured with sampled participants. The purpose of the first presentations was for introduction to the participants, to explain the purpose of the study and data collection instruments to the participants, and to arrange for individual interview sessions. Presentation to PLC meetings for focus group sessions took place on the day that the groups were having a PLC meeting. No obstacles were encountered with the availability of participants.

3.6.3 Data collection instruments

Data collection instruments are tools used to gather information required for the study, and should establish the reliability and validity that the researcher needs. Leech and Onwuegbuzie (2010) describe collection instruments as tools used to gather information required for the study. For qualitative data collection, the instruments should establish the trustworthiness which is the integrity and credibility of data (Rossman & Rallis, 2003). Trustworthiness of data instruments also assist in establishing the reliability (whether a variable measure what it is supposed to measure) and the consistency of data collected (Hardy & Bryman, 2004). Johnson and Turner's (2003) typology was adapted in designing data collection instruments for this study.

The instruments used were based on data collection strategies in mixed research where a mixture of open ended items and closed ended items are used. Also a mixture of depth and breadth interviewing and a priori and emergent focus group strategies were used for focus groups. Data collected using questionnaires comprised of closed structured questions that provided options for the participants to choose response. Qualitative instruments used for inquiry informed the development and refinement of quantitative instruments (O'Cathain, Murphy & Nicholl 2010). Individual and focus group interviews comprised of unstructured and semi structured interview questions which aimed at expanding data that from questionnaires which was not sufficient to draw conclusion and from documents that were used.

There were cases in data collection instruments where the same data was collected using the same types of instruments e.g. questionnaires/ interview questions from different participants for use in comparing and validating data. In some cases different instruments were used to collect the same types of data from different participants in order to reinforce data that was insufficient to draw conclusions such as questionnaires and interviews for individuals, individual interviews and group interviews or documents and interviews for triangulation and drawing conclusions. The instruments are presented in Annexures J (Questionnaires), K (Individual interview questions) and L (Focus group interviews).

3.6.4 Conducting a pilot study

A pilot study was done as a miniaturized walk-through of the entire study. As recommended by McMillan and Schumacher (2010:202) a pilot test of the questionnaires was conducted before use. To do so, a sample of subjects whose characteristics were similar to those that would be used in the study was located. This exercise helped to establish whether the timeframes for the study were realistic and if the questions were clear for the participants. For the pilot study, the questionnaires were given to the subject advisors who are not in the sampled districts and Physical Science teachers who were not part of the sample for the study.

The possible responses of focus groups were tested using two groups of five Physical Science teachers from a PLC which were not part of the sampled focus groups. The questions were given to the ten pilot participants. A week was allocated to respond to questionnaires and interview questions thereafter they were collected from the participants. The pilot study helped in establishing gaps in the instruments, ambiguity of the questions and misunderstandings by pilot participants which indicated areas that needed to be restructured in the instruments. Responses that could not provide usable data assisted the researcher in restructuring some questions and removing some so that all responses answered the research question.

3.6.5 Collection of data

Since the study followed a mixed method research design, quantitative and qualitative data were collected. McMillan and Schumacher (2010) indicate that quantitative research is objective in measuring and describing phenomena with the use of numbers, statistics, structure and control with a goal of describing the trends or explaining the relationship between variables. On contrary, qualitative research emphasizes gathering of data on a naturally occurring phenomenon, mostly in the form of words rather than numbers. If one's data are texts, this implies qualitative data. Qualitative data is collected in face-to-face situations by interacting with selected persons in their setting and is used to describe and analyse peoples' individual and collective social interactions, beliefs, thoughts and perceptions (McMillan & Schumacher, 2010).

Quantitative techniques are used to isolate and identify the correlates associated with variations at a specific moment in time, whereas qualitative techniques are used to gain insight into the processes and events that provide unexpected insight (Borkan, 2004). Collins, Onwuegbuzie and Sutton (2006) formulated five major standard research objectives relevant for the quantitative and qualitative phases of the study. They are: exploration, description, explanation, prediction, and influence. A Sequential Mixed Methods Analysis (SMMA) by Onwuegbuzie & Teddlie, (2002) was adapted though collection of quantitative data using available data rich documents and questionnaires to interpret the quantitative findings. Where responses did not provide satisfactory information required data was expanded through qualitative data. Integration between qualitative and quantitative phases occurred at both the beginning and the end of the study (Borkan, 2004).

Data collection responses for similar questions were grouped together thereby reducing repeating responses which assisted with data correlation, consolidation, comparison and integration. Quantitative data were displayed in tables and graphs and later explained qualitatively whilst qualitative data were organized according to the responses addressing relevant questions. Qualitative data were presented in the form of narrative texts. The presentation of the quantitative and the qualitative analyses was integrated in a sequential manner to facilitate comprehension.

3.6.5.1 Collection of quantitative data

Quantitative data collection followed a non-experimental descriptive approach which was done through document analysis and questionnaires. In a non-experimental quantitative design things that have occurred are described and relationships between them are examined without direct manipulation of experience. A descriptive approach simply provides a summary of existing phenomenon by using numbers to characterize individuals or a group. Its purpose is limited to characterizing something as is (McMillan & Schumacher, 2010).

Data collected on the Physical Science performance was purely numerical. It was related to a subject advisor responsible for the support of Physical Science teachers in that district. Participating teachers, principals and subject advisors were then given questionnaires comprising of closed ended items (Johnson and Turner, 2003). Questionnaires included questions about the subject content and the pedagogy to teach Physical Science, other factors included in the questionnaires were qualifications, competency, subject knowledge and interest as well as perceptions of participants. The responses required participants to respond by either giving one word or circling a preferred answer (See Annexure J).

3.6.5.2 Collection of qualitative data

Merriam (2009) attributes the use of a basic qualitative approach to most qualitative research found in education and this approach was adopted for this study as well, seeing that the study also investigated education matters. The goal of basic qualitative study is to understand how people make sense of their experiences (Merriam, 2009). Interactive data was collected through individual interviews and focus group interviews. Individual and focus group interview questions comprised of a mixture of structured, semi-structured and unstructured questions which differed in depth and breadth (Johnson & Turner, 2003). Some interview questions, both individual and focus group, expanded on information requested in questionnaires to increase detail.

Interviews are methods of gathering information through oral quiz using a set of pre-planned core questions. It is a process in which a researcher and participant engage in a conversation focused on questions related to a research study (De Marrais, 2004). The most common form of interview is the person to person encounter in which one person elicits information from another whether with an individual or a group of people. Its purpose is to obtain a special kind of information. During interviews the interviewer can pursue specific issues of concern that may lead to focused and constructive suggestions which can be very productive (Shneiderman & Plaisant, 2005). Advantages of collecting data through interviews are that during interviews direct contact with the users often leads to specific and constructive suggestions. The researcher can obtain detailed information and few participants are needed to gather rich and detailed data (Shneiderman & Plaisant, 2005).

Ribbins (2007) describes the purpose of interviews as being to explore what is within the minds of other people, though he cautions against putting the researcher's ideas into the minds of the interviewees. Patton (2002) adds that interviews are conducted to find out things that cannot be directly observed, felt, thought and intended. Interviews allow one to enter the other person's perspective. The researcher must first establish rapport with the respondents. If the participants do not trust the researcher, they will not open up and describe their true feelings, thoughts, and intentions. An important skill in interviewing is being able to ask questions in such a way that the respondent believes that he or she can talk freely (Thomas, Nelson & Silverman, 2014).

Interviews enabled the researcher to have a face to face discussion with participants. There are different types of interviews used in qualitative methods that range from semi-structured (using a topic-guide) through to less structured (in depth) interviews. Unstructured interviews were conducted for this study on the basis of a loose structure made up of open-ended questions defining the area to be explored. Some questions that provided data required to answer the primary question were the same for all participants.

(i) Individual Interviews

Individual Interviews were first conducted with sampled Physical Science subject advisors in all secondary questions to establish their opinion about themselves Other individual interviews were conducted separately with the Physical Science teachers and their principals to establish their views on the roles of subject advisors and to establish if there were differences or similarities between their responses and those of the subject advisors.

(ii) Focus group interviews

Focus group interview were conducted after a series of individual interviews, to further explore the general nature of the comments from different individuals (Shneiderman & Plaisant, 2005). Focus group interview techniques can be efficient because the researcher can gather information about several people in one session. Focus group interviews are usually enjoyable for the participants, and they may be less fearful of being evaluated by the interviewer because of the group setting. Patton and Cochran (2002) argue that focus group interviews might provide quality controls because participants tend to provide checks and balances on one another that can serve to curb false or extreme views. The group members get to hear what others in the group have to say, which may stimulate the individuals to rethink their own views (Thomas, Nelson & Silverman, 2014).

Four focus group interviews were conducted in each of the four districts after the researcher collected data using individual interviews with sampled Physical Science teachers. They were used to triangulate with traditional individual interviews (Cohen, Kahn, & Steeves, 2000). The focus group employed interviews on a specific topic with a small group of Physical Science teachers within the same geographic area in a district, herein referred to as professional learning communities (PLC). The numbers ranged from ten to twelve (10-12) Grade 10-12 Physical Science teachers. The subject advisors for each PLC group were asked to be absent from focus group meeting since discussions at these meetings were about them.

In focus group interviews, the researcher did not persuade the group to reach consensus. All participants were assured confidentiality of all data collected and it was explained that it would only be used for the purpose of the study. To make participants willing to provide sufficient data required during the discussion of the issue of concern, the researcher took notes, rather than use a tape recorder, because participants were uncomfortable with the use tape recorders (Patton & Cochran, 2002). At key points through the discussion, the researcher summarized issues discussed and read them to the group to check if their responses were correctly captured.

3.7 PHASES OF DATA COLLECTION

The study comprised of five phases of data collection. Data collected though quantitative method took place only in the first phase of data collection phase and was used to generalize findings by verifying and augmenting study results from members of a defined population in phases two to four of this study as well as for data analysis (Ivankova, Creswell, & Stick, 2006; Creswell & Plano Clark, 2007). Quantitative data and results provided a general picture of the research problem but qualitative data was used to refine, extend and explain the general picture (Subedi, 2016). Documents which had been identified to provide data for this study were accessed, studied and required information was extracted.

Questionnaires were given to participants either in hard copy or e-copy. Interview sessions were scheduled with participant (teachers, subject advisors, school principals and subject advisors) at a time and place convenient for them. This was done so to avoid disturbing the participants from carrying out their jobs at their workplaces. Interviews with principals and teachers were scheduled after school at their school or over a weekend; those with subject advisors were scheduled for after hours at their respective workplaces or over the weekend. For focus group interviews, participating subject advisors were asked permission for the researcher to attend a PLC meeting where groups of willing teachers would be interviewed after their meeting. Only notes were taken to record data at the PLC meetings because most teachers did not accept being recorded.

3.7.1 First Phase

In the first phase quantitative data were collected by extracting district Physical Science analysis of results for the past four years for sampled districts. The provincial DCES and subject advisors were given questionnaires in hard copies at a subject meeting then emailed later. They were given three days each to respond and email or give to the researcher. Sampled school principals and teachers were given questionnaires via email and requested to respond within three days. Data collected about the Physical Science Grade 12 results performances were organized in a table and that collected from questionnaires were organized according to the responses of the participants in tables and graphs .

3.7.2 Second phase

The second phase focused on individual interviews with the provincial DCES then with Physical Science subject advisors. The interview with the DCES was scheduled for a day of a provincial subject meeting after the official gathering. For subject advisors the sessions were scheduled a day and time other than a working time. Individual interviews were kept to one interview session per participant. Interview responses were captured in writing and read to the participant after data collection for verification of their responses.

3.7.3 Third phase

The third phase comprised of interviews with principals. This was done as per appointment either after school or on a Saturday. Individual interviews were kept at one interview session per participant. Interview responses were captured in writing and read to the participant after data collection for verification of their responses.

3.7.4 Fourth Phase

The fourth phase entailed the focused individual interviews with Physical Science teachers. This was done as per appointment either after school or on a Saturday. Individual interviews were kept at one interview session per participant. Interview responses were captured in writing and read to the participant after data collection for verification of their responses.

3.7.5 Fifth phase

The fifth phase comprised of a visit to PLC meetings with subject advisors to conduct focus groups on what participants perceive to be the roles of subject advisors and whether subject advisors play an important role in improving the quality of Physical Science at schools. The number of participants was kept at to between 10 and 12. It was explained to teachers who did not want to be part of the sample that they had the right to leave. All focus group interviews took place after a support group meeting and in all instances, the subject advisor for those support groups were excused from the discussions since the interview was directly linked to them. Interviews for support groups were kept at one interview session per group. Interview responses were captured in writing and read to the participant after data collection for verification of their responses.

3.8 DATA ANALYSIS

Relying solely on one type of analysis in a mixed research can lead to interpretive errors about the underlying phenomenon studied (Leech & Onwuegbuzie, 2007). Employing both quantitative and qualitative methods of data analysis can help investigate problems in ways that a mono method or even multiple methods (i.e., two or more quantitative or two or more qualitative) approaches cannot (Lowenthal & Leech, 2009). The mixed method research for this study influenced the data analysis method which is classified by Onwuegbuzie and Teddlie (2002) as: data reduction, data display, data transformation, data correlation, data consolidation, data comparison, and data integration.

Data reduction refers to reducing the dimensionality of the qualitative data and quantitative data. Data display involves describing pictorially the qualitative data (e.g., matrices, lists) and quantitative data (e.g., tables). Data transformation stage involves the conversion into narrative data that can be analysed qualitatively. Data correlation involved quantitative data being correlated with qualitative data. Data consolidation involved the combination of both quantitative data and qualitative to create new data sets. Data comparison entails comparing data from quantitative data sources with that from qualitative data sources. In the data integration stage, the final stage, both qualitative and quantitative data are integrated into a coherent whole.

3.9 DATA VALIDATION /LEGITIMATION

Data validation in mixed methods involves assessing whether data collected was valid or legitimate. Mixed methods are neither more nor less valid than specific approaches to research as with any other research (Bazeley, 2004). He adds that validity stems more from the appropriateness, thoroughness and effectiveness with which research methods are applied and care is given to thoughtful weighing of the evidence from the application of a particular set of rules or adherence to an established tradition. To validate qualitative data, instruments used should establish trustworthiness in order to measure the quality of research trustworthiness (Leech & Onwuegbuzie, 2010). Validity is concerned with the issue of whether a variable really measures what it is supposed to measure (Hardy & Bryman, 2004).

The validity for this study was established by comparing responses from the DCES, subject advisors school principals and teachers about the roles of subject advisors in improving the quality of the teaching of Physical Science. Quantitative data from provincial documents were presented as is and analysed whereas questionnaire data were stored as is and then data presented was grouped together for analysis. An explanation of quantitative data was done, which was then used to strengthen qualitative data. Responses of focus groups and individual interviews were transcribed verbatim and coded. At the end of interview sessions, responses were read to participants to verify that data captured was a true reflection of the response.

Triangulation was done, both between the qualitative and quantitative data and through comparisons of documents and questionnaire responses as well as interviews. Questionnaire responses as well as a transcript of participants' individual interviews and focus groups with questions and responses are attached as appendices in order to allow the reader an opportunity to recognize experiences of participants. To ensure reliability of analysis data, a record of all evidence of responses to data collection instruments were stored for use in analysing data.

3.10 ETHICAL CONSIDERATIONS

Every study requires a set of ethical considerations. The validity and reliability of a study depends upon the ethics of the researcher. Despite the set rules of ethical considerations, actual ethical practice comes down to the individual researcher's own values and ethics (Merriam, 2009). Ethical considerations that this study considered were: explaining the purpose of the study and methods to participants, risk assessment, informed consent, confidentiality, data access and ownership (Patton, 2002).

3.10 1 Explaining the purpose of the study and methods to participants

After obtaining ethical clearance to collect data, appointments were made with participants to explain the purpose of the study and methods of collections that would be used to collect data. Questionnaire were issued at these sessions and mediated to participants.

3.10.2 Risk assessment

Risks involved with data collection were eliminated. These included aborting lesson observations due to a resolution by a teachers union to which most participants belonged. Others include not disclosing the names of participating teachers to subject advisors and to other participants and conducting individual interviews at a place where only the participant and the researcher were present. Participants at focus groups who were not comfortable disclosing information about their subject advisor for fear of information leaks in spite of signing confidentiality forms, were excused from participation. Hard copies of data collected are stored securely in lockable cupboards and e-copies will be stored securely in the researcher's computer with a password for five years. Data collection did not result in physical or psychological pain/problems/side-effects, persecution, stigmatization or negative labeling.

3.10.3 Informed consent

Informed consent is a mechanism for ensuring that people understand what it means to participate in a particular research study so they can decide in a conscious, deliberate way whether they want to participate. According to Kumar (2005) it involves seeking permission from participants to participate in the study. Participants were issued with consent forms and requested to sign them and submit a copy to the researcher (Annexure I).

3.10.4 Confidentiality

Confidentiality involves the manner in which the information is safeguarded and the identity of the people and the institutions involved are protected (Punch, 2006). It is not always easy or even possible to measure the dangers of a certain context to a given population, let alone to individuals. Smythe and Murray (2000) emphasize the need to pay attention to people's own words about what is important in their lives. They also show how qualitative researchers may be ethically conflicted as it involves some degree of personal involvement of researchers in the lives of participants. The researcher engaged in constructing meaning based on participants' accounts which may result in contradictions between participants' own interpretations and the interpretive understanding of the researcher (Smythe & Murray, 2000).

Assurance for confidentiality of data was included in permission letters for participants. The setting and participants were not identified on paper as per requirements (McMillan & Schumacher, 2010). Coding or categorizing of data was undertaken to facilitate understanding and retrieval of information in almost any approach to analysis. Whether they are called variables, themes, concepts, categories or values, responses were “coded." Codes are the means by which data are transferred from one format into another, or between qualitative data analysis (QDA) and statistical software. The kinds of things codes can stand for are similar in the different soft wares, but the way they are generated and the way they are used are often quite different, making for potential complication of interpretation when they are read in a different context (Bazeley, 2004). Coding was used to avoid the use of real names of subject advisors, principals, teachers and focus groups as well as the names of districts. The code names for subject advisors were S1, S2 etc., for principals P1, P2 etc., for teachers for individual interviews as T1, T2 etc. and for focus groups as F1, F2 etc. and for the districts it was DO1, DO2 etc.

3.10.5 Data access and ownership

It is essential to protect the identity of the person from whom information is gathered during research as well as the data provided. The identities of the participants were protected at all times and not left lying around in notebooks or unprotected computer files (Patton & Cochran, 2002). Responses from data collection instruments were not shared with anyone. All data collected verbatim was retyped and saved in a computer. Access for the study will only be provided to the university once the results of the study have been released and published.

3.11 LIMITATIONS OF THE STUDY

Limitations for this study were as follows. The researcher’s role as a Physical Science subject advisor in the same province as sampled subject advisors created reluctance among certain participants to avail time for interviews until the researcher pleaded with them to consider the time factor as crucial. In one district permission to collect data was delayed since there was no director at the district office due to the former's deployment elsewhere. In two districts, district directors had swopped offices which caused a delay in sending information and increased data collection time. Collection of data from principals and Physical Science teachers was complicated by the fact that subject advisors of the schools concerned were anxious to find out what the participants had said about them. They feared that the researcher was on a fault finding mission.

An explanation was provided that data would be available at the right time on request. The responses of some teachers and principals did not address the questions but rather addressed challenges with the expectation that the researcher would escalate them; others were vague. In such cases another appointment had to be set with affected participants, the purpose of the study re-explained and another interview session scheduled. The collection of data (e.g., through the focus groups) in a natural setting of the workplace was time-consuming. Invitations to meetings took longer than anticipated. In some districts teachers were unwilling to participate in group interviews until persuaded by their subject advisors. Participants were cautious about revealing information which might affect good working relations.

After having obtained permission from the other districts, the researcher, also a subject advisor, was unable to attend some meetings to collect data because of urgent prioritized responsibilities in her own district since data collection in another district meant taking leave or working half day. During focus group interviews the participating subject advisor had to be excused from the meeting to ensure valid and reliable responses from the teachers. Some participating teachers misinterpreted the session as a platform to voice concerns about their subject advisor in spite of the researcher's efforts to clearly explain the aim of the session. The major limitation was the inability of the researcher to conduct school visits with the participating subject advisors due to a resolution taken by some teacher unions preventing subject advisors from conducting classroom observation.

This resulted in school principals and sampled teachers advising the researcher not to visit schools so school visits for observation were cancelled. Despite all limitations, most responses provided reliable information and shed light on the factors that contribute to the performance of Grade 12 Physical Science.

3.12 CONCLUSION

Chapter three has outlined the research methodology for the study. This covered the incorporation of both the qualitative and quantitative study that allowed the researcher to collect a substantial amount of data which could not be addressed by a single method. The instruments to collect data included available raw data, the questionnaires designed by the researcher, interview questions and school visit observation templates. The researcher considered all university and departmental ethical requirements for conducting the study and followed all procedures as expected. Challenges encountered with the instruments and the pilot studies were addressed. The researcher was satisfied with most of the data collected and used it to analyse the findings against the research questions.

The next chapter presents data collected and analysed as well as the summary of findings.

CHAPTER 4

DATA PRESENTATION, ANALYSIS AND DATA VALIDATION

4.1 INTRODUCTION

The purpose of this chapter is to present both quantitative and qualitative data collected from participants from the four districts in a South African Province with the aim of addressing the primary question for this study. Data collected through documents, questionnaires and interview responses was categorized under a similar heading and where applicable tables, diagrams and graphs were used to enhance the text collected from the participants. Data for the same concept was collated using all instruments for this study, then analysed individually. A summary of the findings was done for all data to identify similarities and differences in the responses of the participants so that a non-subjective conclusion could be drawn.

Data analysis methods followed the steps below adapted from Onwuegbuzie and Teddlie (2002).

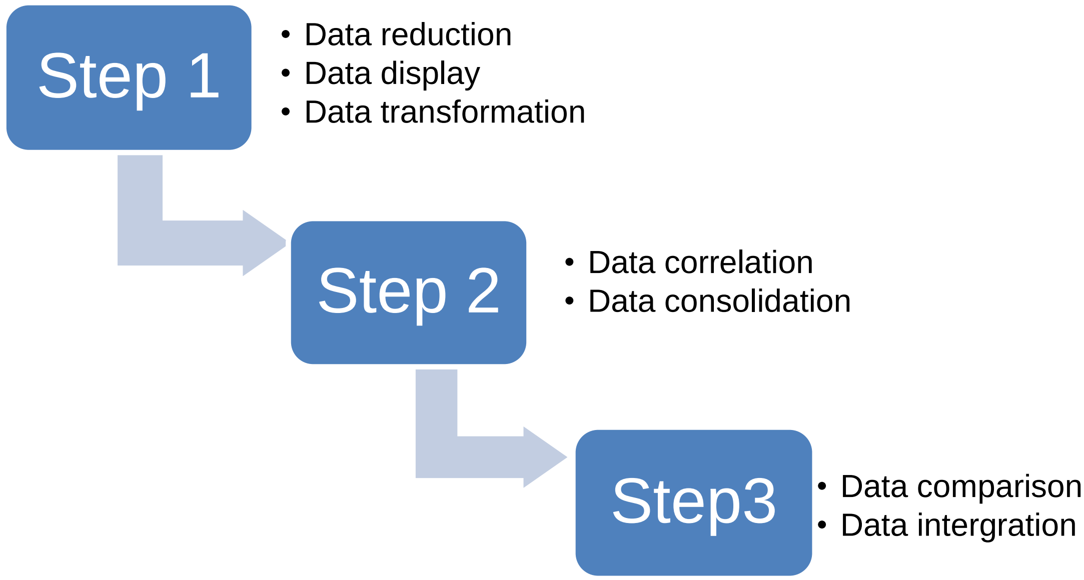

Figure 4.1: Data analysis steps

Adapted from Onwuegbuzie and Teddlie (2002)

Data required to answer the primary question was based on the qualities, subject (content and pedagogical content) knowledge as well as curriculum delivery management and skills. The impact of these factors in enhancing the quality of Physical Science teaching were also investigated for each of the concepts used to answer the secondary questions. Challenges and possible solutions for subject advisory were also explored.

Table 4.1 below shows data that was used to answer secondary questions

Table 4.1: Data to answer secondary questions

Secondary question	**Data used to answer the question**
Do Physical Science subject advisors perceive their roles at schools as playing a significant role in improving the quality of Physical Science teaching?	**QUALITIES OF SUBJECT ADVISORS** • Expected qualities of subject advisors. • The impact of subject advisors qualities in improving Physical Science teaching quality.
Do the Physical Science subject advisors have sufficient Physical Science content and pedagogical content knowledge to assist teachers to improve the quality of the teaching of Physical Science in the FET phase (Grade 10-12)?	**CONTENT AND PEDAGOGICAL CONTENT KNOWLEDGE OF SUBJECT ADVISORS** • Views of Physical Science provincial DCES • Views of Physical Science subject advisors • Views of school principals • Views of Physical Science teachers • Views on the impact of support on content and pedagogical content knowledge to improve quality teaching of Physical Science
What curriculum and management skills do Physical Science subject possess to improving the quality of the teaching of Physical Science in the FET phase (Grade 10-12)?	**CURRICULUM DELIVERY MANAGEMENT AND SKILLS** • Enhancement of teachers' content and pedagogical content knowledge by subject advisors • Roles played by subject advisors in improving Physical Science teachers' interest and commitment • The role played by subject advisors in assisting teachers to cope with curriculum changes

How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?	**CHALLENGES AND POSSIBLE SOLUTIONS** • Challenges to subject advisory • Possible solutions to reduce challenges faced by subject advisors at schools

4.2 DO PHYSICAL SCIENCE SUBJECT ADVISORS PERCEIVE THEIR ROLES AT SCHOOLS AS PLAYING A SIGNIFICANT ROLE IN IMPROVING THE QUALITY OF PHYSICAL SCIENCE TEACHING?

The role of Physical Science subject advisors does not only focus on what the national department of education requires of subject advisors but also predominantly on whether the current cohort of Physical Science subject advisors are the right candidates to improve the quality of Physical Science teaching. To address the first secondary question the study considered qualities of subject advisors: the professional (qualifications, experience and competence) and personal qualities of the current cohort of Physical Science subject advisors and the impact that these qualities have in improving the teaching of Physical Science (Section 2.4).

Figure 4.2 below shows qualities that were investigated.

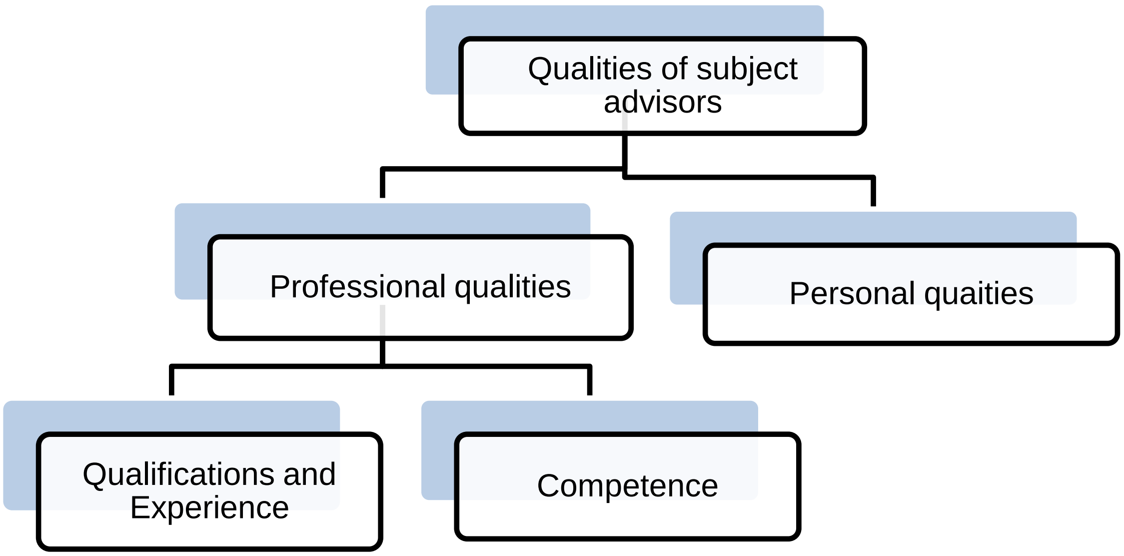

Figure 4.2: Qualities of subject advisors

4.2.1 Professional qualities

4.2.1.1 Qualifications and Experience

(a) Data presented

Data on the qualifications of the subject advisors was collected using Annexure J-2 and verified against a document on the profiles of subject advisors which was obtained from the Physical Science provincial DCES. This was done to see the correlation between national documents and provincial implementation. It should be noted that the appointment to subject advisory position is a promotional position for teachers hence the qualifications for subject advisors look more the same like those of teachers depending on the discretion of a particular province. The DoBE (2011b) document on qualifications of subject advisors document indicate that the requirements for a Physical Science subject advisor in South Africa, is Grade 12 plus four years' tertiary qualification (M+ 4), REQV 15 /an equivalent qualification in Physical Science, registration with the

South African Council of Educators (SACE) and a minimum of six years' experience in the education field.

Table 4.2 and Table 4.3 present data collected through Annexure J-2 on the qualifications and experience of Physical Science subject advisors. The sampled subject advisors are represented by S1 for subject advisor 1, S2 for subject advisor 2 etc.

Table 4.2: Qualifications of subject advisors

S 1	S 2	S 3	S 4
Teaching Diploma with specialization in Mathematics and Physical Science, BSC, Honours degree and degree MSC in medical Biochemistry	Teaching Diploma +ACE with specialization in Physical Science and Mathematics	Bed degree with specialization in Physics and Chemistry and Bed Honours degree in education specialization in Physics and Chemistry	Teaching Diploma +ACE with specialization in Mathematics and Physical Science

Table 4.3: Experience of subject advisors

S 1	S 2	S 3	S 4
20 years and above as a Physical Science teacher and 15-20 years as a Physical Science subject advisor	0-5 years as a Physical Science teacher and 5-10 years as a Physical subject advisor	0-5 years as a Physical Science teacher and 5-10 years as a Physical subject advisor	15-20 years as a Physical Science teacher and 0-5 years as a Physical subject advisor

4.2.1.2 Competence

Competence in the field of education especially in a subject that is challenging like Physical Science is of utmost importance. A person who is competent understands what is expected of him/her and performs those duties as expected. The Physical Science provincial DCES rated subject advisors in the province as moderately competent in Annexure J-1. There are 30 Physical Science subject advisors in the 15 school district in the sampled province, and the response of the provincial DCES indicate that only half the number understood their role and carried them out effectively. The sampled districts subject advisors who formed part of the study could be within any of the half. Of the four principals, three rated subject advisors as mostly competent and one as 50% competent in Annexure J-3.

Professional conduct of subject advisors at schools, the understanding of what it is and if subject advisors are adhering to this behavior was added to data on professional qualities. The responses of teachers in Annexure J-4 on how they rate the professional conduct of subject advisors were: excellent for two teachers, satisfactory for two and acceptable for one. One teacher in an individual interview did not approve of the subject advisor's professional conduct. He/she suspected the subject advisor of not being sober but had not reported the matter because he could not prove it. At PLC meetings no group indicated unacceptable professional conduct of subject advisors; they all indicated that the subject advisors behaved professionally during school visits. All school principals (Annexure K-2) and teachers (Annexure K-3) indicated that subject advisors display acceptable professional conduct.

(b) Data analysis on professional qualities of subject advisors

Subject advisors, principals and 83% of the sampled teachers indicated that they were satisfied with the professional conduct of subject advisors. Qualifications and the combined experience of subject advisors are evidence that the correct appointments were done in accordance with the South African context of Physical Science teaching and learning. Physical Science subject advisors who participated in the study have a required qualification to support a South African Physical Science teacher and an additional qualification that enhanced the knowledge and teaching skills through further education (ACE, Honours and Master’s degree) with specialization in one or both of the parts of Physical Science. Interview responses of subject advisors also indicate that they understand that qualifications are part of professional qualities (Annexure K-1) and very valuable to effective support of the curriculum as expected of them. With regards to experience, the combined experience of the subject advisors as Physical Science teachers and as subject advisors meet the required criteria and includes also the management experience that they acquired as HoD’s whilst at school.

4.2.2 Personal qualities

(*a)* *Data presentation*

Personal qualities focused on the relationship that subject advisors have with teachers that they support. These include attitude towards teachers and interpersonal relationships with teachers, which are not directly related to teaching practices but may have an impact in teaching practices. Subject advisors responses on the impact of interpersonal relationship with teachers indicate that their roles include to a large extent the importance of good interpersonal relations which are confined to working hours. They indicated that showing a personal interest in the teachers' lives is interpreted as caring and this has resulted in trust being fostered between them and teachers which also translate to trust with curriculum related issues. The study investigated the understanding of the relationship between the personal and professional qualities through interview questions. The questions and responses of subject advisors are presented below:

What are the personal and professional qualities expected of subject advisor as an effective one?

> *S1: Good qualifications. Good interpersonal relationships. Understanding of the education system, ability to improvise, ability to work under pressure, help and support with expected and unexpected challenges, such as qualified teachers with no scientific knowledge although they have a qualification. Understanding learners and the way they learn and their challenges. Good subject knowledge, good communication skills.*
>
> *S2: Passion to change the country, one child at a time. The ability to be patient and realize that change will not come overnight. Change takes time and*

perseverance. Passion for the subject. Good organizational skills. Good personal skills – because you need to empower and teach teachers who don't necessarily want to teach learners something new or something challenging. An effective subject advisor must leave the teacher in a better state than he/she was in than before you met her/him. An effective subject advisor is respected and is seen to be effective by the teachers he supports.

(b) Data analysed on personal qualities

The responses of subject advisors indicate that subject advisors understand personal qualities expected of them and how they should utilize them in their work space. They mentioned good interpersonal skills, support and help, guidance, patience, passion. They also indicated that they understand that professional and personal qualifications are related for effective support of the curriculum.

4.2.3 The impact of subject advisors qualities in enhancing teaching quality

(a) Data presented

4.2.3.1 Impact of professional qualities

Subject advisors' were also asked about the impact that professional qualities have on the quality of teaching. The question and the response to the questions were:

What impact has your professional qualities have on the quality of teaching by Physical Science teachers at schools?

S2: My subject knowledge and professional qualifications are part of the success of my relationship and the respect I get from my teachers. Without proper qualifications and content knowledge I cannot give the necessary guidance.

S4: My professional qualities have little effect on the teaching of the subject. The teachers themselves probably see me as a professional. I do not know to what extent this affects the quality of their own teaching.

Form the responses; subject advisors were not sure if qualifications have an impact on teacher quality or learner performance.

4.2.3.2 Impact of personal qualities

The support by Physical Science subject advisors requires them to develop teachers in all aspects of teaching with the main focus on the content knowledge and skills that will assist teachers present effective lessons and carry out quality assessment in the subject of specialization. However in order for this goal to be achieved, Physical Science teacher and school principals have to accept the support and this required good interpersonal relations between them and the subject advisors. The impact of their qualities affects the outcome of their support and they were also investigated.

(i) Views of subject advisors

Interview questions and responses of subject advisors on the impact of personal are presented below:

What impact does personal relationship between you and Physical Science teachers have on the quality of teaching of Physical Science?

S3: All relationships are professional. The greatest extent of some personal relationships is knowing that some teachers have younger children. In some case

I know the names of the children. Otherwise all interaction with teachers is during office hours.

S4: Very big impact. My way of handling teachers, showing them respect is very important. My subject knowledge is very important because teachers rely on me when they experience challenges whether it is in content knowledge or whether it is a teaching methodology challenge.

All four sampled subject advisors agreed that the relationship with teachers may influence the quality of their teaching. One indicated that the professional conduct do not necessarily imply effective teaching practices by teachers; it is up to them to commit to offering quality teaching practices. However the responses of subject advisors have shown a close relationship between personal and professional qualities of subject advisors and their influence in curriculum support.

(ii) Views of school principals

Of the four school principals interviewed on the personal relationship between the subject advisor and their Physical Science teachers, three indicated that according to their observation, the Physical Science subject advisors had a good relationship with Physical Science teachers and appreciate the support received from them. One was not satisfied with the subject advisor and perceived him to be a fault finder to the Physical Science teachers irrespective of their effort in trying to improve the teaching and learning of the subject. Three of the participating school principals indicated in interviews that the Physical Science subject advisors' conduct is professional but one complained about the subject advisor's treatment of the Physical Science teachers which detracted from the relationship.

(iii) Views of teachers

Of the six sampled teachers, five indicated a good personal relationship with subject advisors and welcomed their visits; one teacher indicated otherwise. This was the teacher mentioned by the principal in the foregoing section. Her response to the question is presented below.

How has the relationship between subject advisors and Physical Science teachers affected the quality of teaching of Physical Science at your school?

> T3**:** *Like I said, I get demotivated. Our relationship is not good. He is very personal in most cases; sometimes I think he is hiding his weak points. He wants to prove a point.*

At the four PLC meetings where data was collected, group sizes varied from 1 to 15 teachers. In two PLC's one teacher indicated that the relationship between him and the subject advisor was not tense but it was also not open. He indicated that the subject advisor is autocratic and opinionated. Another teacher concurred. He had been initially supported by another subject advisor whom he felt was more supportive and knowledgeable and now prefers to seek curriculum assistance from peers at workshops and subject meetings or do his own research.

(b) Data analysed

The responses of subject advisors, school principals and Physical Science teachers in both questionnaires and interview questions indicate understanding of the importance of sound relationship between teachers and subject advisors. They indicated that if the relationships are good, support is effective and intervention by subject advisors is welcome. Teachers who were satisfied with the personal conduct of subject advisor were likewise satisfied with their professional conduct and the kind of support they receive. On the contrary, teachers who indicated dissatisfaction did not appreciate the support by that subject advisor nor did they recognize its impact. As mentioned one teacher and principal identified a troubled relationship (Annexure K-3). The teacher did not acknowledge the importance of the subject advisor because he/she suspected gaps in the subject advisor's content knowledge and subsequent attempts to cover this up.

Responses of participants concerning the personal and professional conduct of subject advisors suggest that these two aspects are seen together and not in isolation. If the personal relations are not good, professional intervention is affected and this has an adverse effect on support intended. Kilminster and Jolly (2000) concur that the relationship between the supervisor and the supervised agents becomes a crucial element for an effective supervision.

4.3 DO THE PHYSICAL SCIENCE SUBJECT ADVISORS HAVE SUFFICIENT PHYSICAL SCIENCE CONTENT AND PEDAGOGICAL CONTENT KNOWLEDGE TO ASSIST TEACHERS TO IMPROVE THE QUALITY OF THE TEACHING OF PHYSICAL SCIENCE IN THE FET PHASE (GRADE 10-12)?

Subject advisory involves subject mastery needed to support teachers with the subject in question. Subject knowledge in this study implies all knowledge that is related to content and pedagogical content knowledge in Physical Science. In South Africa, the curriculum is guided by the CAPS policy document with which Physical Science must comply. Physical Science subject advisors are responsible for improving teaching quality and subject performance in Grade 10-12 according to the CAPS document.

Subject advisors acknowledged that some of them are more inclined to either Physics or Chemistry or both - depending on their area of specialization at higher institutions or their interest. Data was collected to establish the content and pedagogical content knowledge of subject advisors. Figure 4.3 was developed based on the views of the

Physical Science provincial DCES (Annexure J-1), Physical Science subject advisors (Annexure J-2 and K-1), school principals (Annexures J-3 and K2) and Physical Science teachers (Annexures J-4, K-3 and L1-4).

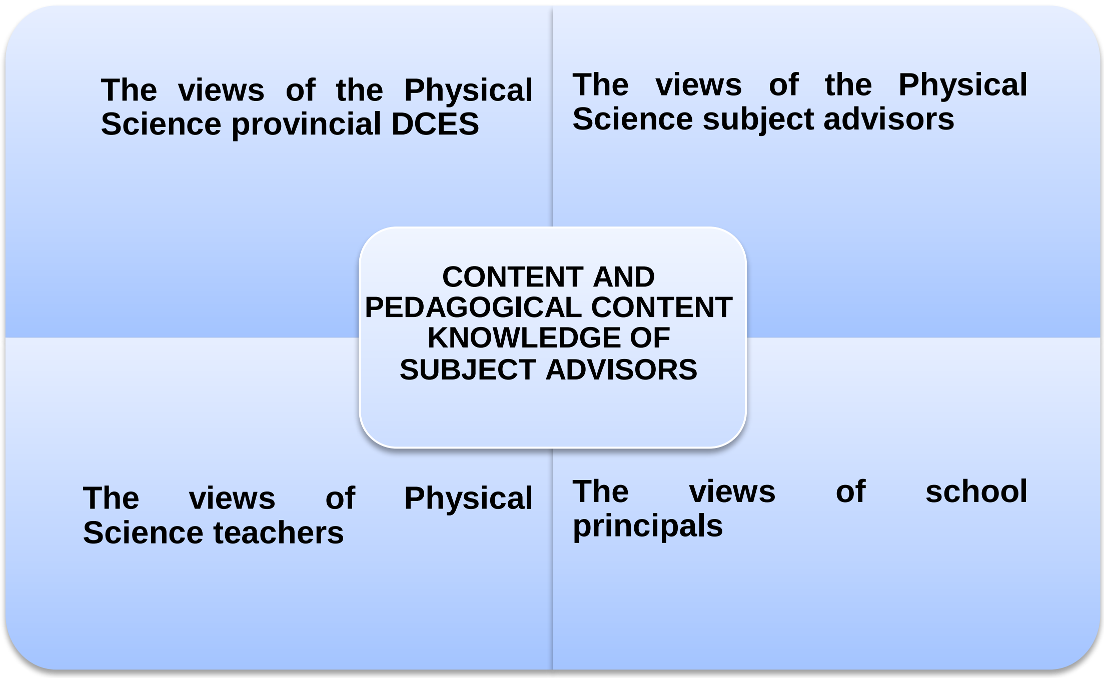

Figure 4.3: Views on content and pedagogical content knowledge of subject advisors

(a) Data presented

4.3.1 The views of the Physical Science Provincial DCES on the content and pedagogical content knowledge of subject advisors

Physical Science subject advisors report their performance to the provincial DCES and a composite provincial report is compiled using these reports. As a result, data collection for this study included the views of the provincial DCES for Physical Science on the performance of subject advisors. The Physical Science content and pedagogical content knowledge involves current curriculum policy which requires compliance in teaching and assessment as stipulated in the CAPS document. The researcher asked the Physical Science provincial DCES if Physical Science subject advisors are conversant with subject policies and encourage their implementation at schools. Her response was that most of the subject advisors are knowledgeable with the CAPS policy document and encourage its implementation at schools. On the content and pedagogical content knowledge, the question asked to the provincial DCES for Physical Science was:

Do all Physical Science subject advisors have sufficient content knowledge to support and develop Grade 10-12 Physical Science teachers at school?

Her response was*: "At most, half of them."* The response of the provincial DCES indicates dissatisfaction with the content and pedagogical content knowledge possessed by most Physical Science subject advisors. Her comment could mean that the sampled district subject advisors are included in those who have sufficient content knowledge or those who do not. The researcher inquired further on this topic through questionnaires and interview questions for subject advisors.

4.3.2 The views of subject advisors on their content and pedagogical content knowledge

The questionnaire asked subject advisors if they consider themselves having sufficient content and pedagogical content knowledge to support Physical Science teachers in Grade 10-12. All indicated that they have sufficient knowledge to support Grade 10-12 Physical Science teachers. However, all subject advisors indicated that their support is more effective in Grade 12 when compared to Grade 10 and 11 because the performance of schools is based on the Grade 12 results. Subject advisors indicated that although they have sufficient content and pedagogical content knowledge to support Physical Science from Grade 10-12, they also have their preferences in Chemistry and Physics (Annexure K-1). However, they endeavor to offer support in both, although they would welcome support and development in the part in which they are not strong as well as with regard to alternative teaching methods including the use of ICT. The related interview question and responses of two subject advisors in interviews follow:

Which knowledge areas do you regard yourself as having sufficient content and pedagogical content knowledge to support Grade 10-12 Physical Science teachers?

> *S3: All topics in the curriculum, but I always prefer Chemistry.*
>
> S4: *I have been interacting with the content for this amount of time. The good thing is that I also have the same level of qualification in both disciplines namely Physics and Chemistry. I would say that I have sufficient content knowledge and pedagogical content knowledge in all 12 of the content areas for FET.*

4.3.3 Views of school principals on the content and pedagogical content knowledge of subject advisors

Principals as school managers have to ensure that curriculum implementation is of the required quality and that it impacts positively on the overall performance of the school. The personnel who should assist with the improvement of the curriculum require competencies to ensure that this happens. In the questionnaire, principals were asked to rate the impact of the intervention by subject advisors on the quality of teaching Physical Science at their schools and on the types of intervention in place. Out of the three options (Excellent, satisfactory and acceptable), two principals chose excellent, one satisfactory and one acceptable (Annexure J-3). They also indicated that their teachers were happy to work with subject advisors on issues related to the subject.

When asked to respond on the content and pedagogical knowledge of subject advisors in the interviews, principals indicated that they had not received any complaints from teachers in that regard. They acknowledged the improvement that resulted from content workshops organized by subject advisors, professional learning communities and the extra content material provided to teachers for the enhancement of the subject. When asked where they would ask for Physical Science subject related assistance, principals indicated that they would consult subject advisors. Possibly principals are not in a position to evaluate the subject knowledge of subject advisors because the latter's interaction with school principals is minimal, based on reporting progress and challenges of the subject or of the teacher, and where required, requesting intervention without details regarding subject content.

4.3.4 Views of teachers on the content and pedagogical content knowledge of subject advisors

In order for learners' performance to improve, teachers must possess adequate content and pedagogical knowledge. Most teachers agreed that intervention by subject advisors contributes positively to their content and pedagogical knowledge development**.** Their responses (in Annexures J-4) show that four of the six participating teachers were satisfied with the content and pedagogical content knowledge of their subject advisors; one indicated that he/she was not completely satisfied and one indicated that he/she was not satisfied at all. Questionnaire responses, based on the response of the majority, indicated some level of trust in terms of subject knowledge of subject advisors. However, the response does not differentiate among subject knowledge in the whole Physical Science content, Chemistry content or Physics content. In the interviews, teachers were allowed to elaborate. The question posed was as follows:

Do you regard the Physical Science subject advisor as having sufficient Physical Science knowledge to enhance the quality of Physical Science results at your school?

The responses of the three participating teachers were:

> *T4: He is very good in Chemistry than in Physics.*
>
> *T5: She is knowledgeable in both Physics and Chemistry.*
>
> *T6: They have sufficient content knowledge but we need help with assisting learners to understand content to comprehend the content.*

At PLC meetings, the responses of teachers were similar to individual interviews (Annexures L1-L4). In three of the four PLC groups, teachers felt that their advisors have sufficient content knowledge because of the content and teaching and improvement strategies discussed at support group meetings. However, in one PLC meetings, teachers indicated that their subject advisor leaned more towards Chemistry content support than Physics content support; two PLC groups indicated equal support in both Physics and Chemistry. All three PLC groups indicated that in addition to content, subject advisors share teaching and assessment strategies.

In one PLC meeting they indicated that the subject advisor asks teachers to share how they teach the subject rather than initiating content discussions or getting too involved in the discussions. Thus, they cannot assess the sufficiency of his content and pedagogical content knowledge; during school visits he offers general support but not content support. They indicated that they receive support in the content at provincial content workshops held by the provincial teacher development unit for the province every term.

Do you think that your subject advisor has sufficient Physical Science content knowledge to reinforce the content knowledge that you already have? Elaborate based on the Physical and content knowledge.

> *F1: Yes, the subject advisor used to shows us how to approach some topics and to show the important of content we need to teach for example for properties of Organic molecules we were advised to revise grade 11 work on intermolecular forces.*
>
> *F2: She has sufficient knowledge to reinforce content knowledge. She even gives strategies and makes it more practical. She knows it and does not even read a note, just says it.*
>
> *F3: Not, not on a single instance has he facilitated /presented a content workshop.*
>
> *F4: I know she has sufficient Physical Science content. She can also relate it to everyday life situations*

(b) Data analysed

Data collected on the content and pedagogical content knowledge of subject advisors collected through questionnaire (Annexures J-1 to J-4) from the DCES, subject advisors, school principals and teachers were very generic but specific during individual interviews (Annexures K-1 to K-3) and focus group interviews (L1 to L4). The responses of the DCES (Annexure J-1) and school principals (Annexure K-3) on the content and pedagogical content knowledge of subject advisors indicated that they were satisfied with the content and pedagogical content knowledge of subject advisors without specifying the part in Physical Science that they observed the strength of subject advisors.

At one PLC meeting teachers indicated that they could not tell which part the subject advisor preferred or was strong in since the support is based on compliance and not content or pedagogical content knowledge. Responses of Physical Science subject advisors, teachers and PLC members indicated the strength of the content and pedagogical content knowledge possessed by subject advisors (from their views). None of the participants mentioned strength in pedagogical content knowledge. The responses are summarized as follows:

Table 4.4: Confidence /preference in Physical Science content and PCK

Confident/ preference in both Physics and Chemistry	Confident/ preference in both Physics	Confident/ preference in both Chemistry
Two subject advisors Four teachers Two PLC	One subject advisor One teacher	One subject advisor One teacher One PLC

4.4 WHAT CURRICULUM DELIVERY MANAGEMENT AND SKILLS DO PHYSICAL SCIENCE SUBJECT ADVISORS POSSESS TO ENHANCE THE QUALITY OF THE TEACHING OF PHYSICAL SCIENCE IN THE FET PHASE (GRADE 10-12)?

In addition to the qualities (professional and personal) and subject (content and pedagogical content) knowledge required for subject advisory in Physical Science, curriculum delivery management and skills are a prerequisite since the nature of their work is that of managing the Physical Science curriculum. They are required to have thorough knowledge of the current Physical Science curriculum and excellent managerial skills to ensure that compliance and quality in the teaching of Physical Science are achieved. The factors represented in figure 4.4 were explored.

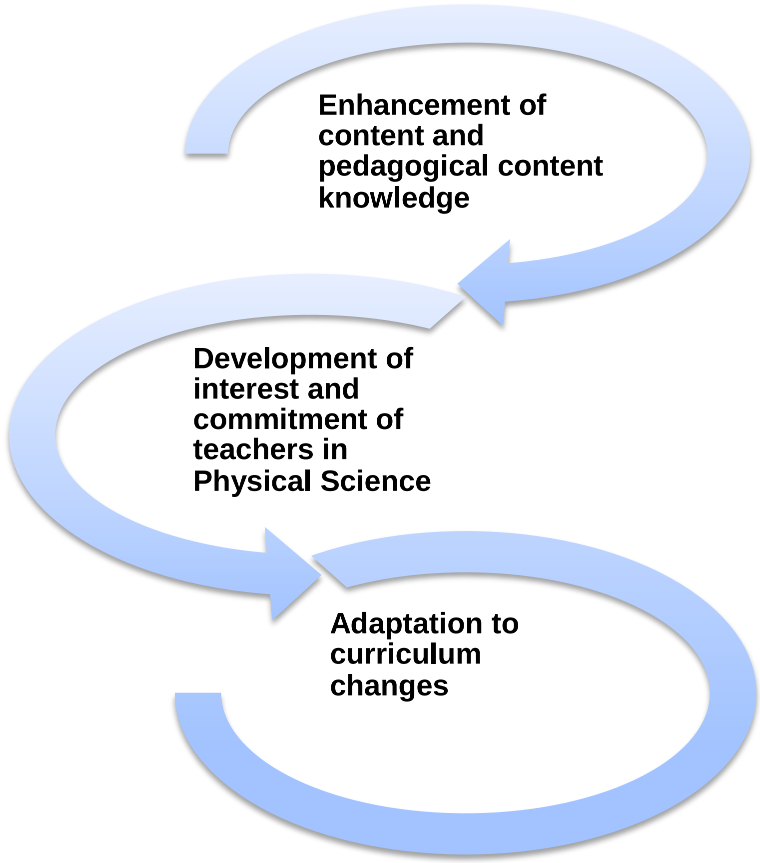

Figure 4.4 : Aspects of curriculum support by Physical Science subject advisors

4. 4.1 Enhancement of teachers' content and pedagogical content knowledge by subject advisors

(a) Data presented

4.4.1.1 Activities performed by Physical Science subject advisors

Subject advisors mentioned activities that they perform at schools that are directly related to the support and development of Physical Science teachers and those that re not related to curriculum. Non-subject related activities include other activities that are curriculum related but not Physical Science specific as stipulated in the District Standard Routine and Operation Guidelines (DoBE, 2017a) as shown in the second column of table 2.1 in section 2.5 and as mentioned by subject advisors in Annexures J-2 and K-1. Non subject support related activities mentioned by subject advisors are presented in table 4.5 below.

Table 4.5: Non-subject related activities

Activity	Number of participants who mentioned the activities
10th day head count	3 subject advisors
School readiness	3 subject advisors
Monitor examinations	4 subject advisors
Ensure that schools analyse internal and external examination results and develop strategies to improve performance	4 subject advisors
Check furniture shortages and equipment delivery and shortages	3 subject advisors
Check LTSM delivery and shortages	3 subject advisors

Data on other non-subject support related activities show that the allocation of activities for Physical Science subject advisors is not the same in all the districts. Subject related activities were similar for subject advisors, school principals and Physical Science teachers. Activities mentioned by subject advisors as imperative to improve content and pedagogical content knowledge of teachers were workshops, PLC meetings, moderation of learner tasks, school visits and feedback meetings after school visits and providing extra resources.

School principals mentioned visiting classrooms to do lesson observation, checking teacher files and learner books, moderation of formal activities and holding feedback meetings at the end of the sessions and teachers added provision of support material, advice on effective teaching methods, conduct content workshops, and constructive feedback to the other activities mentioned by subject advisors and school principals. These activities correlate with those mentioned in the documented roles in the Guidelines for district organization, roles and responsibilities of education districts (DoBE, 2011c and DoBE, 2013) as well as District Standard Routine and Operation guideline (DoBE, 2017a). They also correlate with those mentioned in table 2.1 in section 2.5 on curriculum management of subject advisors.

The question posed and the responses of the teachers (Annexure K-3) were:

What kind of intervention strategies has the subject advisor employed to assist teachers in your school with content and pedagogical content knowledge?

> *T1: They give us material and conduct content workshops.*
>
> *T2: None, except give me material.*
>
> *T3: Afternoon sessions used for feedback after school visits are very useful. The advices to give weekly tests help a lot.*
>
> *T4: He gives us material and advises us on teaching presentation at workshops.*
>
> *T5: He advises on which books to use. Whenever he has support material, he sends it to us.*
>
> *T6: We discuss topics and teaching approaches. She advises on how to approach topics; after analysing the results, she advises me on strategies for improvement.*

The responses of teachers at three PLC meetings on the activities performed by subject advisors and impact of subject advisors (Annexures L2, L3 and L4) are presented below:

What are the exact activities that subject advisors when they come to your school? Do the activities of subject advisors help improve your teaching practice and content or the results of the subject, how?

> *F 2: Every bulletin in the CAPS documents she checks if we did it and we have given classwork's, tests etc. She makes sure that we don't skip anything and different tasks are given to each topic.*
> *F 3: To check compliance of policy documents and ATP and SBA completion. Check assessment (if questions asked/given to learners cater all levels of the taxonomy.*
> *F 4: She comes and do class visits to see how we unpack the content and she intervenes in case there are misconceptions and provides guidance.*

Subject related activities are presented in table 4.6 below:

Table 4.6: Subject related activities

Activity	Number of participants	Total number of participants
Check/moderate learner books against the ATP	5 teachers, 2 principals and 2 PLC groups, 4 subject advisors	11 + 2 PLC
Check/moderate teacher files	2 teachers and 2 PLC groups, 4 subject advisors	6 + 2PLC
Visit classrooms to observe teaching practices	4 teachers and 1 PLC group, 2 subject advisors	6 + 2 PLC
Moderate SBA	2 teachers, 2 principals and 1 PLC group, 4	8 + 2 PLC

	subject advisors	
Checks lesson plans	2 teachers	2
Assist with teaching	3 teachers, 2 principals and 2 PLC groups, 1 subject advisor	6 + 2 PLC
Checks CAPS compliance	1 PLC group, 2 subject advisors	2 +1 PLC
Facilitate Physical Science PLC meetings	4 subject advisors,4 principals,6 teachers,4 PLC groups	14 + 4 PLC
Conduct content workshops	4 subject advisors,4 principals,6 teachers,4 PLC groups	14 + 4 PLC

(b) Data analysed

The activities mentioned show that more support by subject advisors is on subject support related activities meant to improve teaching and assessment practices and to enhance teacher's content knowledge and pedagogical content knowledge. Content activities are moderation of learners SBA, assisting with teaching, moderation of learners' books against the ATP, conducting content workshop and facilitation of PLC meetings. The pie graph below shows the % of activities performed by subject advisors at schools as mentioned by participants.

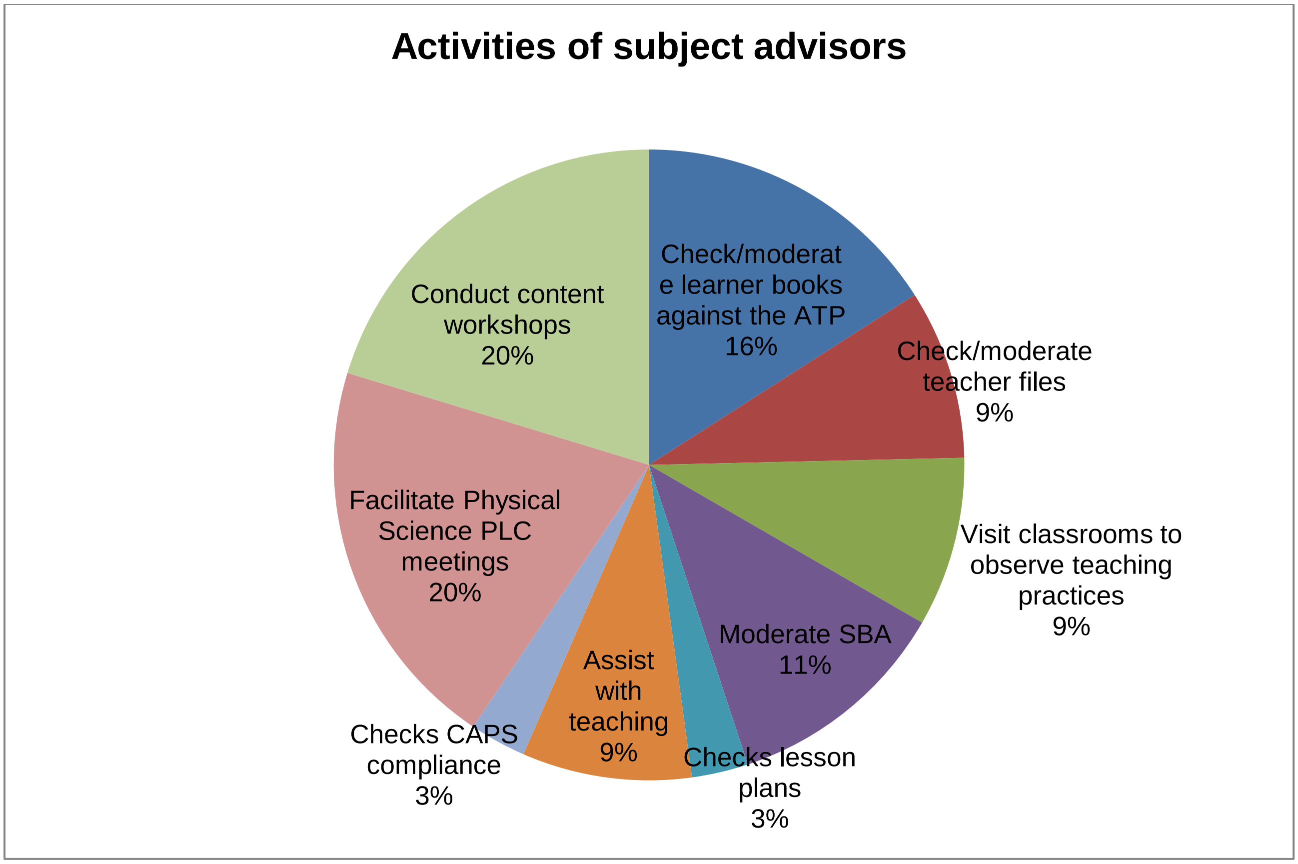

Figure 4.5: Percentage distribution on subject related activities

Table 2.1 for the sampled province in section 2.5 categorizes the activities into support and development and compliance. When data on the activities of subject advisors in the province was compared to the one in table 2.1, the yield of the expected % on support and development vs. compliance showed a close relationship. The total content % is 75% and 25% on the management of the subject/compliance as shown in table 4.7 below.

Table 4.7: ***Enhancement of teachers' content and pedagogical content knowledge***

Curriculum support	Support and development	Compliance
Activities mentioned for the province	• Provision of resources, Support teachers in effectively delivering the curriculum in the classroom (through classroom observation. • classroom observation • information sessions-workshops, PLCs • Moderate SBA • feedback sessions and guidance	• Check that Teachers have all the requisite curriculum and assessment documents and that these are available and followed faithfully. • Record keeping (Marks for formal tasks and subject record of Physical Science LTSM) • Checking that teachers have all necessary support material • Follow –up activities
Activities mentioned by participants	• Check/moderate learner books against the ATP • Moderate SBA, Check/moderate teacher files • Visit classrooms to observe teaching practices • Assist with teaching • Facilitate Physical Science PLC meetings • Conduct content workshops	• Checks CAPS compliance • Checks lesson plans
Expected % for support and development	80%	20%
Actual % for support and development	75%	25%

4.4.1.2 Impact of *Subject advisors activities on enhancement of content knowledge and PCK*

(a) Data presented

Subject advisors regarded all subject related responsibilities as relevant in improving the quality of Physical Science teaching; however some subject advisors and some teachers regarded some activities within the subject related roles as deterrents to effective curriculum support for teachers. The question asked to subject advisors in Annexure K-1 and a response to that regard was:

Do you regard all activities that you have done at schools to be relevant in improving the quality of Physical Science teaching and performance?

The response of one subject advisor was:

> *S3: Yes. I think most activities are relevant, even if it is not actually in my job description, because we make contact with teachers and SMT in schools and build relationships. Examples that improve the subject are workshops, school visits, PLC meetings, subject support meetings, including NGOs that are allowed to visit meetings and expose teachers to the products available on the market. Deterrents might be very long meetings in the office that have nothing to do with the subject itself, meetings with head office (CIF) where no information is given to support us and just talking is taking place, reporting on activities as if the report will improve the quality of support*.

Subject advisors indicated that they have come to understand professional qualities expected of them in that despite a few challenges with curriculum support, they still find time to offer support for Physical Science teachers.

Although teachers welcomed the support by subject advisors, they indicated that they did not appreciate all the activities performed by subject advisors although these are unavoidable as they form part of the subject advisors' roles whereas. The question asked during individual interviews with teachers (Annexure K-3) and responses of teachers follow:

Are all activities done by subject advisors during school visits beneficial to the teaching of Physical Sciences?

> *T2: Not all of them. The files do not have any impact on my teaching.*
>
> *T3: Very beneficial, especially with content and assessment.*
>
> *T4: Their activities are not helping. What is required is support and mentoring.*

When asked about the impact of the subject advisory offered to teachers in the past years on the quality of teaching practices, subject advisors indicated that teachers have gained more confidence in the subject and lesson preparation. Subject advisors' responses to improved teaching quality were based on their observation of teaching and assessment practices as opposed to the results. One subject advisor responded this way:

> *S2: I think it has made an impact, because the teachers have more confidence, they also start to prepare in a more structured way and they also have more activities in the learners' books than in the early years.*

School principals were asked if they have confidence in the support received by the teachers from subject advisors. Of the four school principals participating in the study, three indicated that they have confidence in and prefer involving the subject advisor in matters relating to the subject in addition to subject heads of departments. One principal indicated that he did not have confidence in the support of the subject advisor and preferred to handle subject related matters with the subject HoD at the school (Annexure J-3)

Improvements identified by teachers (Annexure K-3) were: confidence in teaching, lesson preparations, improved content knowledge, improved pedagogical content knowledge and improved assessment practices. Some teachers indicated that the support that they receive from subject advisors has improved their teaching quality. Of the six teachers who were interviewed, four indicated that the support received has improved their content, assessment and lesson presentation; one indicated that he has not received any support on pedagogy; and one indicated that she receives assistance from other teachers.

The question and responses of teachers from individual interviews (Annexure K-3) on the impact of subject advisors' support on content and pedagogical content knowledge are presented below:

In your school how has the intervention by the subject advisor affected the content and pedagogical content knowledge of Physical Science teachers?

> *T1: We are improving every time, especially with advice of scaffolding lessons.*
>
> *T2: No. I get help from other teachers.*
>
> *T3: None with pedagogy.*
>
> *T4: Improved.*
>
> *T5: My teaching and assessment methods have improved.*
>
> *T6: Very beneficial, especially with content and assessment.*

The majority of teachers at PLC meetings indicated that their subject advisors have been helpful with content and pedagogical content knowledge. Some indicated that material received from subject advisors has assisted them improve teaching and assessment strategies. At one PLC meeting teachers indicated that the subject advisor does not assist with content and pedagogical content knowledge but rather curriculum compliance (Annexure L-3). At the PLC meetings the groups were asked the question (Annexures L1-L4) *t*he questions and responses on enhancement of content knowledge and PCK were:

Has the presence of the subject advisor helped you to be developed professionally in the subject/ the teaching methods or would the school structure do fine on its own without the subject advisor?

> *F1: Yes, workshops are conducted every term on content.*
> *F2: It has developed us and makes our work much simple and easy to teach our learners to love the subject and to realize that Physical Science is not very difficult.*
> *F3: He has helped me on other issues like compliance to the CAPS policy and is a very supportive person.*
> *F4: Yes, she facilitates workshops and provides electronic materials which support teachers.*

The researcher considered aspects of curriculum monitoring by subject advisors mentioned in section 2.6. These include planning, curriculum coverage, acceptable quantity and quality of assessment tasks, instructional leadership, effective use of instructional time, classroom management, correct use of the language of instruction, effective use of teaching resources and curriculum compliance. Based on the factors mentioned above, the teachers were asked to rate the support provided according to the criterions *satisfactory, acceptable or not done*. Table 4.8 presents the responses of six teachers.

Table 4.8: Responses of teachers on components of curriculum support (Annexure J-4)

Rate the impact of the support by the subject advisor on the following components of curriculum support			
	Satisfactory	Acceptable	Not done
Planning	5	1	
Curriculum coverage	4	2	
Quality and quantity of assessment tasks	6		
Instructional leadership (teaching methods/styles)	5	1	
Effective use of instructional time	5		1
Classroom management (during a Science period)	4	2	
Correct use of the language of instructions	3	3	
Effective use of teaching resources	4	1	1
Curriculum compliance	5	1	
Total	41	11	2

Table 4.8 indicates that the majority of teachers view the support of subject advisors as satisfactory.

(b) Data analysed

The responses on the impact of content and PCK support were required from school principals and teachers only to allow them to provide reliable information based on their observations. Responses from principals were not subject specific but they indicated that school principals were generally satisfied with the support offered by Physical Science subject advisors.

The ratings of the support are shown in the bar graph below:

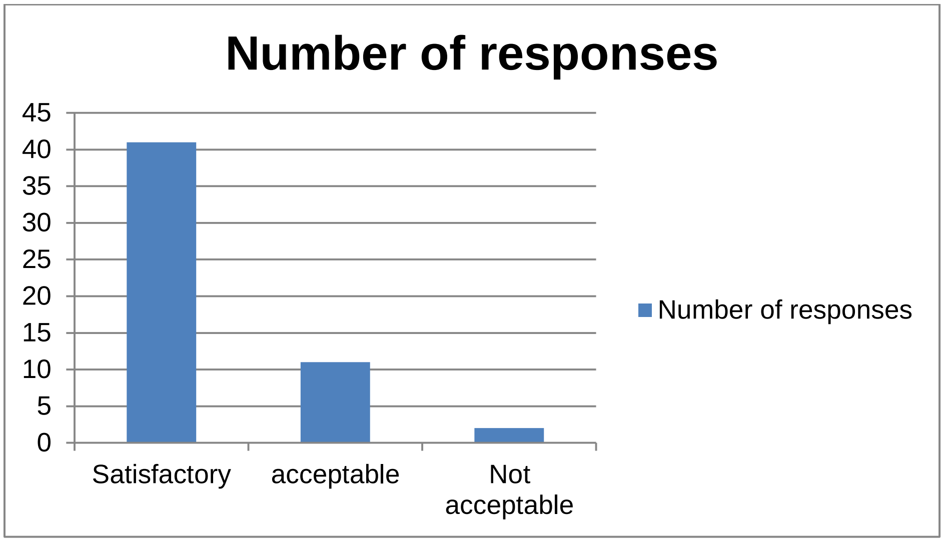

Figure 4.6: Satisfactory level towards subject advisors support

The responses of teachers indicated a high level of satisfaction with subject advisors support.

4.4.1.3 Frequency of school visits for content knowledge and PCK enhancement

Teachers' content and pedagogical content knowledge of teachers is improved mostly through school visits. The frequency of school visits by subject advisors was indicated as a factor that affects the impact of the support offered. Subject advisors indicated that the frequency of school visits depends on the performance of the school in the Physical Science results in the previous year. For example, the poorest performing schools are visited more than schools that perform well. They indicated that the visit to the schools depends on the need of the school but also indicated the importance of consistent school visits.

One principal and two subject advisors' responses to a question in an interview (Annexure K-2) on the frequency of school visits respectively were:

> *P1: "Two times per term".*
>
> S1: *Depending on the performance of the school I visit them more than once per term, up to 4 to 5 times to help and support and do follow up visits. A good performing school is visited at least once a term. If needed I will visit more.*
>
> *S3: Once per month, but twice if there is a need for follow up.*

Of the six teachers interviewed on the number of school visits, one indicated that the subject advisor visits every week, two indicated at least once per term; two indicated twice per month; and one indicated once per month. Five of the six teachers, however, indicated that they would appreciate more visits since this implies more support. One teacher commented, *"If they come a lot, it would be helpful."*

Subject advisors conceded to the importance of regular school visits by indicating their wish to conduct more school visits. When asked what impact the frequency of school visits has on the support and development provided by subject advisors, the response of one subject advisor was:

> *S1: Consistent visits to the schools are most effective in assisting teaching the subject. Consistent visits will ensure that thorough follow ups are done.*
> *S3: It helps if you visit more than once, because the teachers are more aware of what they are supposed to do and they tend to change. If there is no follow-up visit, they ignore any comments written in a report.*

All participants appreciate school visits by subject advisors but more desire for the support through school visits to increase.

4.4.2 Improving Physical Science teachers' interest and commitment

Among factors that can influence the quality of teaching is commitment, attitude and interest in the subject. Participants' response to interest was subjectively based on their experiences as they dealt with teachers. Some subject advisors indicated that exposure to science expos, alternative teaching methods such as the use of ICT and providing extra teaching and assessment resources have improved teaching quality whereas others argue that, in addition to extra support provided, teachers need to be self-motivated to improve their commitment and interest in order to improve the quality of teaching. The question posed was as follows:

What role can subject advisors play to ensure that teachers commitment and interest in teaching Physical Science?

Two subject advisors answered as follows:

> S1: *Be positive. Improve their knowledge, build their confidence and continuously expose them to interesting science activities outside the class room and the world out there. Also expo and interesting projects are important.*
>
> S2: *The roles of the subject advisors in ensuring teacher commitment and interest are limited if not non-existent. Teachers' minds cannot be changed unless they themselves want to change.*

Subject advisors added that content workshops, feedback meetings and PLC meetings to which teachers are invited have assisted in providing guidance and constructive feedback. This has improved good relations between subject advisor and teacher and teaching approaches. The response of one subject advisor in an interview on role of constructive feedback was:

This has given the teachers the opportunity to build a good relationship with me and they are not afraid to ask me anything and expose their own incompetency in content or teaching.

4.4.3 Assisting teachers to cope with curriculum changes

The South African Physical Science school curriculum has undergone rapid change in knowledge, concepts, technology and philosophies in the past decade, affecting the quality of results. Subject advisors have to assist teachers to cope with these curriculum changes by ensuring proper implementation and frequent follow up to assist teachers to a point that they feel confident with the current curriculum. The question asked on curriculum changes and selected responses by subject advisors are presented below:

What impact has the support offered by the subject advisor had on the way teachers cope with curriculum changes in Physical Science to ensure that quality teaching is improved?

S1: The quality has improved through the years, especially with teachers that are quite some time in the system. Many of my Physical Science teachers have obtained promotion posts and are HODs, or deputy principals or are already principals.

S2: Luckily the CAPS has not changed. The introduction of the CAPS was an excellent strategy to unify the education department. This has leveled the playing field and allowed all learners the same access to the curriculum.

To add to the support required by teachers, the researcher considered the continuous support with the implementation of the new curriculum in assisting teachers to improve teaching practices and learning as well as holding teachers accountable for effective teaching and Physical Science results. Subject advisors indicated that they help teachers with experiments, the use of available resources to enhance teaching, extra support material and expose them to effective teaching methods. One subject advisor said:

> S2: *I am always available to support and willing to help. This positive attitude has had a positive effect on the teachers, but also on the learners. They know they can ask anytime and will get the necessary support to improve their teaching. Help with experiments, equipment and providing them with work sheets, additional support material and power point presentations and didactic challenges have made the teachers confident in the class room*.

4.4.4 Impact on Physical Science learner performance

The researcher considered that if the teaching quality has been improved, this should mean better Physical Science results. The sampled province obtained a pass rate of 70,2 % in 2017 (DoBE, 2017c). The pass percentage of the province is an inclusion of fifteen districts, whereas the study was done in four districts in the province. The Grade 12 pass percentages of the four districts for the past four years were considered to determine the impact of the support by subject advisors in this period.

Data on the grade 12 Physical Science results of the four districts is presented below and correlates with the responses of subject advisors (DoBE, 2017c).

Table 4.9: Physical Science pass rates in sampled districts

District	2014	2015	2016	2017
DO1	78,2	77.6	75.2	82,5
DO2	70,9	67.5	71.6	75,6
DO3	58,1	71.6	68.1	66,2
DO4	59,9	62.5	55	52,3

The Physical Science results are inconsistent in the district. They have been fluctuating in the past four years. None of the sampled district shows a consistent increase in the Physical Science results from 2014 to 2017.

With regard to the correlation between the impact of the roles of subject advisors and the quality of teaching, one subject advisor said:

> *S1: The impact on the teaching has been positive. There is a definite change in the teachers and how they approach the subject. However, this did not translate to consistent improvement of the Physical Sciences results in the past 5 year. There is a general improvement in all schools, but some schools still haven't registered a steady improvement of results.*

The response of a teacher with regards to the impact of subject advisors support to the performance of Physical Science results was:

> *T1: Yes. They improve teachers because the subject advisor is not there to criticize but to support teachers. However, they have not improved the results at my school.*

Subject advisors and some teachers acknowledged that although the teaching quality has generally improved, this has not been matched by the improvement of Physical

Science results in some schools. They attribute the reason for the discrepancy in the quality for the teachers versus the quality of the Physical Science results to the quality of the learners taking Physical Science at schools. The argument of one subject advisor was:

> *S4: The overall quality has improved. However the quality of leaners enrolled of the subject has deteriorated. This has impacted directly on the efforts of the SES's and the teachers.*

4.5 HOW CAN THE SUPPORT AND DEVELOPMENT GIVEN BY SUBJECT ADVISORS TO PHYSICAL SCIENCE TEACHERS BE IMPROVED OR AMENDED IN ORDER TO INCREASE THE QUALITY AND QUANTITY OF PHYSICAL SCIENCES RESULTS?

Subject advisors are custodians of curriculum delivery. They are expected to assist teachers with the content, assessment practices and intervention for weaker learners in the subject of specialization. However, curriculum delivery is a joint effort by the DoE, subject advisors, school principals and Physical Science teachers. If there are challenges that may deter subject advisors from carrying out their duties as expected, this may have an adverse effect on curriculum delivery, rendering the roles of subject advisors in curriculum support less important than intended. This section first focuses on challenges identified by subject advisors, school principals and Physical Science teachers before considering how support can be improved.

4.5.1 Challenges impacting Physical Science subject advisory

This chapter presents the challenges encountered in the support and development of Physical Science encountered by subject advisors. Data on challenges encountered in subject advisory was collected as represented in the diagram below:

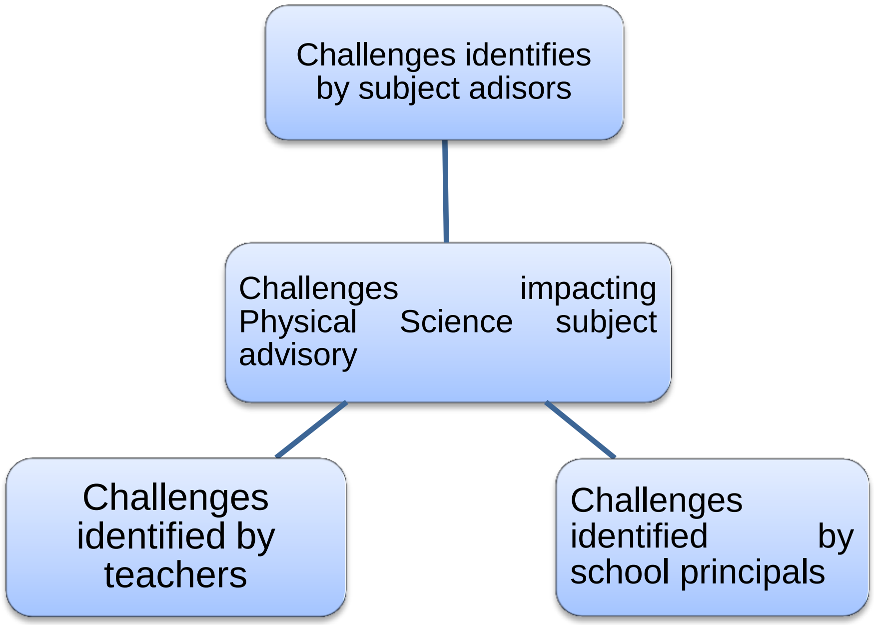

Figure: 4.7: Challenges impacting subject advisory

(a) Data presented

4.5.1.1 Challenges identified by subject advisors

Effective support for Physical Science depends on all stakeholders involved in curriculum delivery. The factors in the diagram represent challenges faced by Physical Science subject advisors to effectively support teachers in improving the quality of Physical Science teaching. Challenges identified by subject advisors deal with those related to the DoBE, school principals, teachers and teacher and learner unions.

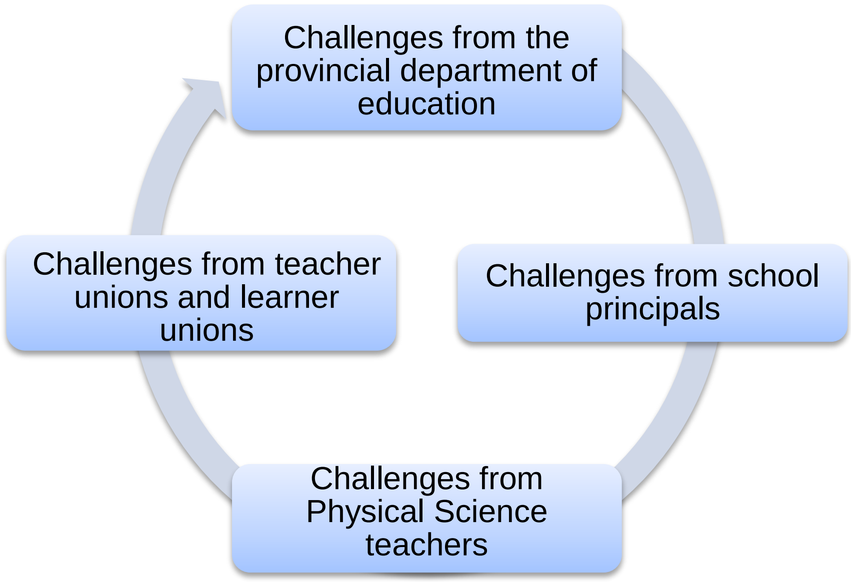

Figure 4.8: Challenges identified by Physical Science subject advisors

(i) Challenges from the Department of Education

Challenges that subject advisors indicated as emanating from the department of basic education are: the neglect of subject advisors, undefined roles, education policies, capacity of subject advisors and lack of collaboration (Section 2.8).

(a) Neglect of subject advisors

The difference in specialization at higher institutions to that at schools and the strength /preference of subject advisor in the Physical Science curriculum has resulted in limited content and pedagogical content knowledge of subject advisors which has affected quality support for Physical Science teachers. The separation of the two specialization parts of Physical Science at university is the reason why subject advisors who specialized in one of the two parts require support and development in order to match the South African school curriculum needs which does not separate the two components of Physical Science. When subject advisors were asked about their content and pedagogical content knowledge, some indicated that they did not have a qualification in Physics and Chemistry, which signifies a complete Physical Science curriculum or that they prefer one over the other. Three subject advisors indicated that they require assistance in Chemistry topics, and one in Physics content. In Annexure J-1 they responded to the questions asked as follows:

Which knowledge areas do you regard yourself as having sufficient content and pedagogical content knowledge to support grade 10-12 Physical Science teachers?

S1: All topics in the curriculum, but I always prefer chemistry
S4: Physics

Subject advisors have indicated that currently there is no professional development program to assist them with closing the content gaps due to their qualifications. They are responsible for their own professional development through ongoing study at universities, own research and peer support to address personal limitations in content and pedagogical content knowledge. The questions and the responses of subject advisors were:

Which professional learning opportunities are available for subject advisors?

S2: I am only aware of university degrees.

S4: None in our province

Which knowledge areas do you require content and pedagogical content knowledge development to support grade 10-12 Physical Science teachers?

S1: I always feel I need support on Mechanics

S4: Chemical Equilibrium and Kc

Qualifications only are not the only reason for the need for professional development in Physical Science. The fact that the South African school curriculum has undergone several changes over the years and that new teaching methodologies such as the use of ICT in teaching are been promoted. Their inability to cope with content and pedagogical content knowledge has resulted in them not being able to provide such to teacher.

(b) Undefined roles

Findings on the specific roles of Physical Science subject advisors indicate that despite documented roles stated in G*uidelines on the Organisation, Roles and Responsibilities of Education Districts 2011 and 2013* (DoBE, 2011c, 2013) and the District Standard Routine and Operation guideline of 2017 (DoBE, 2017a) to assist with the functionality of district officials, these documents still do not specify the roles of subject advisors. Some of the activities mentioned by subject advisors were projects related to the improvement of Physical Science such as camps and the MST projects which are the responsibilities of the project coordinator at districts since by nature they are administrative.

The different interpretation of documents on roles and responsibilities of districts has resulted in district director deciding on the activities that they deems necessary for curriculum support, hence subject advisors mentioned that instead of using all time available to support Physical Science content and pedagogical content knowledge, time is consumed by other responsibilities such as school readiness and class lists.

When four sampled districts subject advisors were asked in the Annexure J-2 whether their roles are subject related, three indicated that their roles do not only include the subject assigned to them, one indicated that they are only assigned subject related duties. Other activities are imperative for curriculum support but are not subject specific. They are administrative duties for school management such as school readiness, counting of furniture, 10th day head count, data collection which also have human resources at districts whose job description fit into these roles.

The questions and responses of subject advisor on other non-subject related activities are presented.

Are the roles of subject advisors consistent across the districts, understood by all subject advisors the same way and implemented consistently in all districts?

> *S1: No. the various district directors demand different approaches. The schools are different and therefore we also have to approach the way we deal with schools differently. The subject advisors are different with different capabilities and different skills and approaches. The induction of subject advisors are not the same when they enter the system and therefore the roles are not understood in the same way.*
>
> *S4: District directors use their discretion to allocate duties. Sometimes they wake up to the need for Physical Science support when the district drops the results.*

Is there a correlation between documented roles of subject advisors and activities that district managers expect them to fulfill at schools?

> S1: *The documented roles are stipulated in the rules and regulations from DoBE and also in the job description of subject advisors. Because we are humans, we interpret the roles differently. It also depends on the topic under discussion. The*

demand for reporting differs per term and also per time of the year. In the beginning of the year district managers demand diagnostic analysis of results and all kinds of activities that are not part and parcel of our normal roles, but it is expected to help with other units. Examples are 10th day head count or assessment monitoring or school readiness.

If there are roles of subject advisors at district level that are not necessarily subject related, how have they affected the effectiveness of subject advisors in improving the quality of teaching of Physical Science at schools and the performance of the subject?

S1: We cannot perform our normal school support duties when other activities are demanded form subject advisors. The time to visit schools is very limited and if the time is utilized to its maximum we do not manage to support 100%.

S3: The other roles outside actual advising on the subject and actually supporting teacher to teach often take too much of time and waste the time of the subject advisors. For example special projects even though related to the subject are the responsibility of the subject advisor. Such projects do not need subject expertise because they are administrative.

The responses of subject advisors about other responsibilities allocated to them indicate that district directors in different districts have different interpretations about allocation of responsibilities. The three who indicated other duties assigned to them also mentioned that they are satisfied with the support that they render to schools, although they would like to do more. One was not satisfied. Subject advisors indicated that other activities impact on the consistency and the quality of support they give to schools.

(c) Education policies

The performance of Physical Science is influenced by policies in place. In the case of South Africa the policy on progression implemented in the FET phase in 2013 states that a learner may only be retained once in the Further Education and Training Phase in order to prevent the learner from being retained in this phase for longer than four years (DoBE, 2012). Subject advisors roles include ensuring that the policies prescribed for purposes of implementing and achieving the objectives for education are effectively carried out (Isa and Jailaini, 2014), however some feel that instead of policies addressing the challenges confronting the school with the performance of Physical Science (Ololobe and Major, 2014), this policy has perpetuated them.

Subject advisors complained that the implementation of the policy on progression of learners' encouraged learners to take Physical Science even when they are struggling with the subject. They indicate that this is a source of frustration for both teachers and learners and a cause for underperformance in the subject. Subject advisors complained that the progression policy puts pressure on subject advisors and teachers to increase the number of Physical Science passing Physical Science even if at a lower level. They argue that it defies the whole purpose of improved teaching quality and learner performance because the focus shifts from quality teaching to increasing the quantity of learners passing Physical Science.

The interview question responses of subject advisors (Annexure K-1) on pressure resulting from progressed learners were:

What are challenges that you encounter about teachers that negatively impacts on the quality of their teaching and the performance of learners? How do you deal with challenges?

S1: Learners at risk are the latest challenge that affects the quality of teaching. No plan is needed for learners who can actually do Physical Sciences. Subject advisors use the 'learners at risk' as a beating tool for educators. Educators are traumatized when they do not have concrete evidence of how they will teach learners who do not want to pass Physical Sciences.

S2: *In my opinion the 'progressed learners/ learners at risk' is a new challenge that is diverting the energy of the subject advisors. The subject advisors are focusing in helping educators support these learners. Very little attention is being afforded to the performing learners*.

S3: The progression policy is a political move to win votes in my opinion. The Department of education is run by politicians whose focus has nothing to do with education. How can the progression policy assist in improving quality?

S4: The policy on progression has exacerbated the problem of certain teachers who do not want to work hard. They want to teach internal classes only because they will not give am account of the grade 12 results.

The opinions on the progression policy differ however depending on observation of different subject advisors. Those who agree with the progression policy indicted that there is evidence, which was also presented by the director general for the department of basic education in his 2017 presentation to provinces, that reports on the performance of the cohort of the progressed learners from 2016 to 2017 has shown that some of the progressed learners not only passed when they were given a chance for multiple exam but some passed with distinctions (DoBE, 2017b). The argument presented is that progression is required in the case where the poor performance of learners is a result of the poor quality of teaching and not because of learners' poor grasp of the subject.

(d) Capacity of subject advisors

The sizes of district are not considered in allocating the number of Physical Science subject advisors in that despite the difference in the number of schools in the districts, the provincial department of education has allocated the same number of subject advisors for Physical Science. Van der Berg, Taylor, Gustafsson, Spaull and Armstrong (2011) suggest that in designing the functions of district offices, consideration should be given to capacity issues. Findings on the support for schools by subject advisors show that the uneven distribution of subject advisors in the district already mentioned has affected the support required by schools. The four sampled districts have a different number of schools. One district has 19 schools, another one 54, another one 65 and another one 110. However, all sampled districts are in the same education region and each has two Physical Science subject advisors respectively.

The number of Physical Science subject advisors allocated for a bigger district is insufficient to carry out the duties required (Ogunu, 2005) and has limited what can reasonably be delegated to district offices. The understaffing of subject advisors for bigger districts is the cause of inadequate support due to heavy workloads and time constraints (Enaigbe, 2009). Subject advisors in bigger districts indicated that they were not satisfied with the amount of support offered due to fewer school visits and correlated with sentiments of school principals and teachers who indicated that they would like to be supported more frequently through school visits. The number of school visits has affected the number of content workshops given to teachers in a district, the monitoring of support groups and monitoring of effective intervention by teachers at schools. The implications of lack of capacity for bigger district concede with HRDC report of 2014 that most subject advisors found it impossible to visit all the schools once in a year and possibly 30% or more of the schools were not visited at all. The impact of support in the quality of Physical Science teaching is very little in a bigger district than in a smaller district.

One subject advisor indicated that in some subjects within districts, there are few schools to support; in other cases there are more schools yet the amount of support is rated the same way by district management officials for all subject advisors. She indicated that in her district almost all schools offer Physical Science and thus, the workload is more than for other more scarce subjects, for example Information Technology. Expectations of the same outputs in all subjects by the district directors in each district results in great pressure on Physical Science subject advisors, in addition to the poor performance in Physical Science in schools compared to that of other subjects.

(e) Lack of collaboration

Every activity taking place in a school is related to curriculum development directly or indirectly. In South Africa, the roles of subject advisors differ from province to province. They still continue to work in separate corners (Mavuso, 2013), frustrating school managers who find it difficult to understand various forms of reporting since seldom is the same information requested by different district officials. Physical Science subject advisors argue that many responsibilities which belong to other units in the district office are made their responsibilities because they are linked to curriculum support, instead of requesting subject advisers to work together with such units. One subject advisor indicated that in his district, even if there are two Physical Science subject advisors in a district, subject advisors are responsible for 33 and 32 schools each, in addition to responsibilities such as the MST projects, and another subject which was in implemented in 2016 in Grade 10 and continues to Grade 12 in 2018 which remains the responsibility of Physical Science subject advisors.

An example of facilitation of special projects was given and the argument was that even though the project is related to Physical Science, the responsibility to ensure the smooth running of projects does not lie with Physical Science subject advisors but with the district project coordinator. One subject advisor indicated that projects do not need subject expertise because they are administrative (e.g., learner recruitment for SAICA camps). He viewed any learner recruitment by the subject advisors as a waste of time and having a direct impact on the amount of time subject advisors have to actually advise teachers and help teachers improve their teaching.

Another subject advisor indicated that a lot of similar data is required from schools by different units at the district office, which irritates teachers or school principals and leads to malicious compliance. One such example is requirement of subject performance statistics from subject teachers which is requested by district data capturers, assessment officials and subject advisors on different occasions. He indicated that in most cases when such information is requested, the same information is not populated using the same template. Each of the district officials want the same information presented in different ways. An example mentioned by subject advisors was the difference in subject results as presented by the district DCES from another unit and what subject advisors collect from subject teachers at schools.

In an interview response (Annexure K-1) on other duties that could be performed by other district officials, the responses were:

> *S1: I am responsible for MST, Technical Sciences and any other project related to Science. This puts a severe strain on supporting teachers. The outside projects take up more than 60% of my time. I would recommend that all projects be handed to special projects. A ratio of 1 SES to 20 schools be applied.*
> *S2: The district directors and the district DCES seldom compiles a list of schools to be supported the most based on the performance of the school in all subjects. Then there is the Physical Science provincial DCES who expects more support to other schools based on poor performance I Physical Science. In addition there*

are cluster leaders and circuit managers in each district who have been assigned a certain number of schools. I have to account for results for their schools. The challenge is that for example if there are six circuits in a district and two Physical Science subject advisors in a district, all the circuits share the same subject advisors and there cannot be equal support based on prioritizing schools according to performance.

S3: For example special projects even though related to the subject are the responsibility of the subject advisor. Such projects do not need subject expertise because they are administrative e.g. learner recruitment for SAICA camps.

S4: The districts statistics and teacher profiles are actually supposed to be done by another unit however, our provincial coordinator will require term statistics, analysis and teacher profiles from me. There are over 50 schools offering Physical Science teachers. This is just too much. And you know, the pressure they put on me, I also put on the teachers, seldom compromising the good relationship I have with them.

In addition, cluster leaders and circuit managers in each district have been assigned a certain number of schools. One subject advisor indicated that they put pressure on the subject advisors to support their schools because they have to account for school results. For example if there are six circuits in a district and two Physical Science subject advisors, all the circuits share the same subject advisors and there cannot be equal support based on prioritizing schools according to performance. Subject advisors argued that the other roles outside advising on the subject and supporting teachers to teach are too time-consuming and waste their time. They also registered their frustrations to all line managers who put pressure on them.

(iii) Challenges from school principals

(a) Acceptance of subject advisors by school principals

Three of the four sampled subject advisors indicated that they were welcome to schools and even into classrooms. One subject advisor indicated that upon school visits, the principal refused him entry to classrooms to do lesson observations even though the teachers did not object. The excuse of the principal was that a certain teacher union does not allow subject advisors into classes. He said:

> *One principal has refused me permission to attend class. I met with the principal one on one and I explained the importance of class visits. I am still not allowed to go to class in that school.*

Subject advisors indicated that some principals want them to perform classroom observations during school visits because they understand that observations show what is needed to assist teachers with pedagogical content knowledge. They argue that those who are still resistant to classroom observation fear the findings of the subject advisors as it exposes them as being poor managers.

(b) Poor curriculum management by school principals

Findings on challenges about school principals indicate that principals are concerned about the overall management of the school rather than management of curriculum. The challenges mentioned included lack of learner's discipline, lack of support for teachers, refusal of class visits by subject advisors, misuse of norm time and wrong appointments and placement of Physical Science teachers. The findings concurred with those of Hoadley, Christie and Ward (2009) that principals do not spend the majority of their time on aspects of instructional leadership but rather on administrative duties. When subject advisors were asked how committed school principals were in improving the performance of Physical Science in the FET phase at their schools, three subject advisors indicated that they do not think school principals are committed to support Physical Science teachers. All they do is present challenges to subject advisors to solve and nothing more. The question and the responses (Annexure K-1) of two subject advisors were:

What are challenges that you encounter about school principals that negatively impacts on learner performance? How do you deal with challenges?

> *S1: Principals do not really discipline learners and are not really aware of what is happening in a class room*
>
> *S3: "Some principals do not care. There is one that you hardly find at a school. The teachers do as they wish-its free style. You present a challenge to him when you visit a school and suggest possible solutions, next time you come nothing has been corrected, what frustrates me is that even the cluster leader has done nothing to assist me".*
>
> *S4: Principals are not committed to improving the subject. This is because Physical Sciences often jeopardize the pass percentage of the school. The nature of the subject is such that it is not meant for all learners. This means that any learner can take this subject and fail until matric. They often associate the subject with a poor pass percentage. Principals do not attach much hope to this subject. They all acknowledge the importance of the subject to the country but in most cases the subject is a threat in is synonymous with poor performance. Principal will rather commit to passable subjects like Tourism and other humanities.*

Subject advisor S1 in Annexure K-1 indicated that principals are not aware of what is happening in class. Where there was evidence of curriculum management, findings indicated that it was not properly done and reporting was not properly followed as expected, hence follow up visits to help teachers who had challenges with their teaching activities are not done (Ncube, Tshabalala, Muranda & Mapolisa, 2015). They do not follow up improvement strategies that subject advisors suggest for Physical Science teachers. Subject advisors attributed the poor performance in Physical Sciences to the lack of interest shown by principals.

Subject advisors indicated that principals receive school visit reports but most do not seem to read them so that suggestions from the subject advisor are not implemented. School principals show interest in the subject once the school has underperformed to a point that it becomes an MEC school (a school which will be subject to more frequent visits by the district official, head office officials and the education MEC). Circular 38 of 2007 for curriculum reporting by the GDE indicates that one strategy of subject improvement in schools starts with teachers' weekly reports on curriculum progress and assessment practices, heads of departments' (HoD's) reports on departments and deputy principals' bi-weekly report to principals. Of concern is that even when poor teaching is highlighted by the subject advisors to the principal, they are slow to take corrective measures and call a teacher to order. One subject advisor said:

> *S2: Some principals do not care. There is one that you hardly find at a school. The teachers do as they wish. It's free style. You present a challenge to him when you visit a school and suggest possible solutions, next time you come nothing has been corrected, what frustrates me is that even the cluster leader has done nothing to assist me.*

Subject advisors argue that some school principals rely on the 'authority' of the subject advisor to rein in staff whom they are responsible for managing. They indicated that they often need to follow up with the teacher until the problem is solved. An example of this is teacher absenteeism, absconding class, not teaching and not preparing. These problems remain the problem of the subject advisors until solved. Principals are happy to have the subject advisors check on their problem teachers as “often as possible”.

Some indicated that school principals are acceptable to the subject advisors but they do not play their role in promoting good performance in Physical Science. One subject advisor said:

> *S2: Luckily most principals’ attitude is positive. However this has not translated to acceptable leaners performance.*

(c) Misuse of norm time

Subject advisors were concerned that some principals were not familiar with the policy about norm time so they only become aware that they have allocated less time for Physical Science, when the subject advisor alerts them. This may happen late in the year and correction of the time table causes a temporary disruption to classes. Physical Science has been allocated 40 hours per week for teaching and assessment. The CAPS policy document also indicates that Physical Science learners should be assessed daily. Any compromise to norm teaching time can affect teaching and learning**.**

There were cases indicated by subject advisors where learners were taken on excursion or expected to do other things which consume teaching and learning time during the daily timetable. One subject advisors said:

> *S1: At some schools you find that learners are not at school because they are taken to attend an expo or a sporting activity during school hours. The time table is sometimes shortened for extra mural activities and this is done without regarding the notional time of teachers teaching a subject that is overloaded and need every minute.*

Data collected on challenges that subject advisors face due to school principals are all related to correct implementation of policy documents and proper school management which have an effect on the teaching and learning of Physical Science.

(d) Wrong placement of teachers

Another challenge that subject advisor indicated as a deterrent to effective support is the appointment of Physical Science HoD's and the placement of teachers in grades. In many schools, HoD's are not Physical Science subject specialists yet they are appointed in a position that requires them to support and develop teachers with content and pedagogical content knowledge at school level. The cause of this problem is that principals advertise posts for two subjects for HoD's, then appoint a HOD for any two subjects. In township schools, according to one subject advisor, almost half of the HoD's at schools in his districts are either Life Science or Mathematics specialists with very limited Physical Science knowledge.

Subject advisors indicated that in most cases the appointments are politically motivated because principals want to appoint either their friend in the same teacher union, or they are pressurized by members of the union to appoint their preferred candidate. They added that appointments of HoD's in some cases are based on major subjects of teachers, irrespective of their competence in teaching Physical Science. In one case the subject advisor indicated that the HoD in one school has Physical Science as a major subject but since her appointment at that school, she has never taught Physical Sciences and is now expected to manage the subject.

> *S3 said: The challenge of the performance in Physical Science is the appointment of the HoD who is not a Physical Science specialist. Principals know how to cook these positions. They advertise a post with two subjects so that they can appoint their friends. One principal told me that there is no need for subject*

specialization in the HoD post because it is a management position. To my surprise, the appointments are endorsed by the district and provincial offices. So we are fighting a losing battle if we think that two people in a district can support Physical Science teachers on subject related issues in the whole district.

S4: I think the challenge with poor performance if influenced greatly by the HoD. Of the HoD is not a hardworking person who knows the subject ell, how did that person get appointed. But you know these things, people get politically appointed.

The placement of Physical Science teachers within a school is a challenge that delays effective support. Subject advisors indicated that certain schools retain the same teacher in Grade 12 although he/she has not produced satisfactory results, while another teacher in the school is willing to proceed to Grade 12 but denied the chance. Subject advisors suspect that some teachers seek to remain in Grade 12 because of the opportunity to mark Grade 12 exams for remuneration. Conversely, in another school some teachers in the lower classes refuse to take Grade 12 for fear of accounting for results or because of low self-esteem in the subject. This shifts the responsibility to one teacher in a school, usually an effective teacher with the only Grade 12 experience. The problem arises when that teacher leaves the school due to a promotion, transfer, resignation or retirement and a new Grade 12 has to start from scratch.

(iv) Challenges from Physical Science teachers

Quality results are an effort of all stakeholders involved in curriculum implementation; however, teachers remain the sole custodians of quality education given their everyday interaction with learners. The concern of subject advisers is that some teachers do not want be held accountable for Physical Science results and are not committed to eradicating Physical Science underperformance. The quality of the teaching which impacts on the quality of learner performance can be enhanced by subject advisory when teachers demonstrate an openness and commitment to the process, along with a strong sense of self-motivation and self-improvement (Ani, 2007). Lack of accountability and commitment contradict this.

(a) Lack of accountability by teachers

Curriculum implementation needs to be accounted for. Teachers are directly in contact with learners and have to account for the quantity and quality of Physical Science. Accountability implies that teachers have to take responsibility for the understanding of content by learners. One of the methods mentioned by subject advisors is the moderation of formal activities to ensure proper implementation of the curriculum and required minimum standards for all schools. The understanding of content translates to increased number of learners passing the subject as well as good quality results. With regards to accountability**,** however, subject advisors indicated that most teachers do not want to be held accountable for the Physical Science results and always put the blame on learners. Subject advisors' responses to the questions on how their role impacted on the accountability of teachers follow:

> S1: *To a large extent teachers do not accept accountability for the poor performance of the subject. The accountability factor may be hard to explain because teachers are faced with difficult circumstances. As of late the 'learners at risk' are taking up more of the teachers' time while learners who can actually do the subject are being side lined. The skills of the teacher are severely strained and stretched when working with the learners at risk. It seems as though the teacher only needs to focus on these struggling learners in order to increase the pass percentage and not be accountable for poor pass rates. Intervention strategies by the subject advisors to ensure accountability by Physical Sciences*

teachers are ineffective as learners at risk are a system problem not generated by the teachers.

S2: Teachers have a tendency to blame the learners and the system for their own incompetency. They do not want to be held accountable for bad results and it is difficult to change their attitude.

(b) Lack of commitment by teachers

Lack of commitment by teachers was cited by subject advisors as being a challenge in improving Physical Science results. The response of a subject advisor to a question related to commitment of teachers was:

S2: Some teachers have no real responsibility and will stay away from the class room and only teach half of the content and think this will satisfy learners because the learners do not know what they are supposed to study and understand.

*C*ommitment for improved results starts from planning for lessons, to teaching and assessment to making follow up and providing intervention for weaker learners (section 2.6). Subject advisors indicated that some teachers are not committed to good teaching and assessment.

Physical Science subject management added to the challenges on quality Physical Science teaching. Subject advisors indicated that HoD’s do not conduct lesson observations because they do not want to, some are not allowed to do so by certain teachers or if they do, the exercise is fruitless because no corrective measures will be implemented. When moderating written activities. HoD’s find omission of examinable content or insufficient assessment activities. There are cases when teachers only assess what they know; not all cognitive levels are observed in assessment activities or all examinable types of questions.

The question and the responses from two subject advisors follow:

What are challenges that you encounter about teachers that negatively impact on the quality of their teaching and the performance of learners?

> *S1: Teachers do not do proper preparation and plan per period. They also do not try to improve their knowledge by reading more about a topic (not for qualification purposes) but just to make the subject more interesting. They are not interested to give more of their time to start a science club or use their own resources to use for improvised equipment. Teachers also do the marking in the class by simply placing their signature next to an activity, but they do not read the responses of the learners and do not really care if there are gaps in the learners' knowledge or books and no roper corrections are done. The discipline in the class room is also not adequate. Tables and chairs are not neatly organized, learners sit and just watch the teacher teaching without books on the tables and the teacher does not reprimand the learners.*

> *S3: Teachers also do the marking in the class by simply placing their signature next to an activity, but they do not read the responses of the learners and do not really care if there are gaps in the learner's knowledge or books and no roper corrections are done. The discipline in the class room is also not adequate. Tables and chairs are not neatly organized, learners sit and just watch the teacher teaching without books on the tables and the teacher does not reprimand the learners.*

(v) Challenges from teacher unions and learner unions

(a) Teacher unions

Subject advisors indicated that in township schools some school principals do not allow subject advisors to do lesson observations because of the resolution of a single teacher union. Teachers also indicated that some teachers who are affiliates of a certain union refuse to allow subject advisors to do classroom observation when they visit schools. The teacher union in question rejects the initiation of administration of common exams and tests which are aimed at standardization of assessment. The teacher union on the other hand argues that teachers need to be empowered to set their own exams and tests. Subject advisors argue that this is in process since common exams and tests are only meant for underperforming schools.

The question and the response of one subject advisor were:

Which other challenges are faced by subject advisors that hinder them from effective Physical Science subject support?

> *S4: My inability to get to classes in the township school to observe teaching practice is a big concern for me. My perception of teaching is that good teaching is not predominantly based on content knowledge but on the methodology of delivering sufficient content. Most teachers have the same qualification which to me translates to good content knowledge but for me the difference is how to assist teachers to teach effectively and that is been taken from us. Strangely, former model C schools and independent schools do not deny us access to classrooms and by comparison they perform better at Physical Science than township public schools. One wonders if the reason by unions that they want*

their members to be developed is genuine or an excuse to conceal incompetence.

The move by unions to stop lesson observation creates an excuse for teachers who do not want to teach well because they will not be exposed. The argument of teacher unions is that lesson observations should be done by HoD's to maintain consistent and regular support. However, to most HoD's and some teachers, the inability of subject advisors to observe lessons means they can teach as they wish.

(b) Learners' unions

Subject advisors, school principals and teachers indicated another challenge to subject advisory was the learner union, Congress of South African Students (COSAS). In township schools, most teaching and intervention time is wasted by constant class disruptions by COSAS where learners are taken out of schools to boycott, mostly concerning non-curriculum matters. This is beyond the control of school principals and teachers but consumes teaching and learning time and support by subject advisors. This results in perpetual underperformance and poor quality teaching.

4.5.1.2 Challenges identified by school principals

Challenges presented by school principals were common tests and examinations, personal relationships between teachers and subject advisors and the frequency of school visits. One school principal cited the attitude of the subject advisor toward the Physical Science teacher at his school as a major contribution to the teacher's teaching and assessment practice. He indicated an unhealthy relationship between the two, and argued that the subject advisor is a fault finder who is not prepared to assist the teacher. To him the cause of the problem emanated from the subject advisor's lack of content knowledge which he believed he was trying to hide by harassing the teacher, creating anxiety in the teacher. The question and the response of the principal to an interview question were:

Which other challenges are faced by subject advisors that hinder them from effective Physical Science subject support?

> *P1: Limited content knowledge of subject advisors and unprofessional conduct of subject advisors - harassing teachers*.

Other school principals of the bigger districts wished for more frequent school visits at their schools. However, all understood that it is impossible due to the number of schools that require the subject advisors' attention.

4.5.1.3 Challenges identified by Physical Science teachers

Teachers identified the factors represented below as challenges to effective subject support:

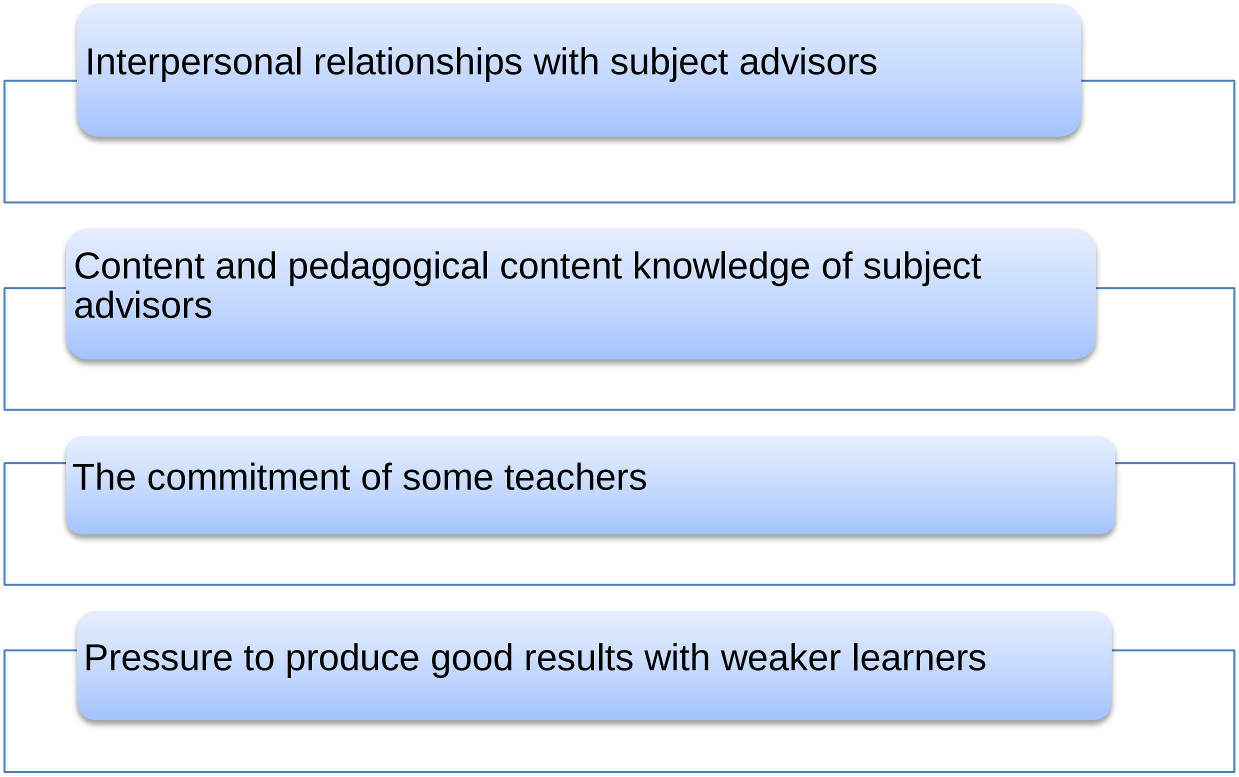

Figure 4.9: Challenges identified by Physical Science teachers

(i) Interpersonal relations with subject advisors

Five of the six teachers sampled indicated that they enjoyed a sound relationship with their subject advisors and that they look forward to learning from the subject advisor in improving the school results. One indicated a broken relationship and insinuated that the subject advisor was covering up for his own content limitations. Her response to the interpersonal relationship between her and the subject advisors was: "*Our relationship is not good".*

This teacher indicated that the subject advisor refrains from considering her overall performance but only concentrates on her shortfalls with the intention to break her down. She never looks forward to the subject advisor's school visit because it is not constructive.

When asked about the activities performed by the subject advisor the teachers response (Annexure K-3) was:

> *He visits the classes but they ONLY pick the mistakes but does not support. On the report that he writes they only report the negative things, never the positive that we do. My subject advisor has provided support material though.*

The teacher also indicated that when she required subject assistance, she never asks her subject advisor but rather consults peers in a neighbouring school. Another teacher from another district did not mention strained relations but was concerned that the subject advisor was a very serious person and holds meetings where he makes comments contrary to the information given in provincial meetings. Most teachers indicated good relationships with subject advisors which also led to acceptance of the support offered. One who indicated good relationship also mentioned that when she needs help from the subject advisors she calls her. The question and her response (Annexure K-3) were:

How has the relationship between subject advisors and Physical Science teachers affected the quality of teaching of Physical Science at your school?

> *S5: I am free to call her anytime*

Teachers relate the relationship with subject advisors to their teaching practices. The responses of teachers show that good interpersonal relations with subject advisors affect their motivation to improve teaching practices which affects results. Bad relations contradict the whole aim of subject support and development of teachers.

(ii) Content and pedagogical content knowledge of subject advisors

The content and pedagogical content knowledge of subject advisors was evaluated by teachers through the questionnaire, individual interviews and PLC meetings. Some teachers observed the strength of the subject advisor in one part of Physical Science (Chemistry or Physics) and indicated a need for improvement in the other part. Some teachers also indicated that their subject advisors have limited content knowledge in certain areas in the Physical Science curriculum and cannot lend help in those areas. The responses of three of the six teachers with regard to content and pedagogical content knowledge of subject advisors follow:

What is your view on the relevance of subject advisor on the current education system?

T1: I think he is more knowledgeable in Chemistry than Physics because he gets bored with Physics content.

T2: I don't think he knows the content. I haven't received any content help from him.

T3: They do have the content knowledge BUT my problem is they do not support us enough with pedagogical content knowledge.

One teacher indicated that the subject advisor assists with content knowledge but gave no support on pedagogical content knowledge. His response was: "*If they support teachers, we need them. The problem is that subject advisors concentrate on the content and neglect the pedagogy part".* The other teacher's response was that the subject advisor visits his school but never supports him in content related matters. He indicated that the subject advisor only asks for files and compliance to the policy documents; at teachers' meetings he only asks teachers to share teaching practices without reinforcing his own strategies. Some teachers argued that subject advisors are not always relevant. T5's response to the relevance of subject advisors was: *"With my subject advisor he is relevant but not all the time. Sometimes he asks for things that are* *irrelevant. Also sometimes he crushes the advice that we get from other workshops that were not conducted by him".*

Some teachers at PLC meetings indicate that subject advisors change content coverage decisions discussed at provincial content workshops because their primary focus is only on compliance and not quality teaching. One teacher's response to challenges that hinder effective curriculum support to his school was: "*He is too serious and too rigid."*

(iii) The commitment of some teachers

At PLC meetings, some teachers indicated that some subject advisors are doing their best to support teachers with curriculum matters but get deterred by teachers who are unwilling to be supported. An issue that delayed curriculum support was the interference of teachers who are members of a union that prohibit classroom observations for all teachers, even non-members. Most teachers indicated that teachers who refuse classroom visits also refuse to carry out common standardized assessment tasks from the provincial office and the district offices. This had been a problem in the districts for the past three years.

In individual interviews one teacher indicated that some teachers at his school will stay away from school if it is the day for the Physical Science school visit. He indicated that instead of them being open about their shortfalls in the subject, they avoid or ignore the visit. The question asked was:

What challenges about Physical Science teachers are faced by subject advisors that hinder them from effective Physical Science subject support?

The response of two teachers was:

> T3: *Some teachers, when they know that the subject advisor is coming to their school they become dodgy because they know they do not have the required documents.*
>
> *T5: Some teachers just stay away from schools when it is the day for the subject advisor to visit.*

Many teachers accept the support of Physical Science subject advisors and acknowledge the wrong done by others. Most are committed to working hard to improve teaching quality amidst the challenges encountered at schools.

(iv) Pressure to produce good results with weaker learners

Teachers at PLC complained about the lack of screening of Physical Science learners in Grade 10; hence every learner chooses the subject irrespective of aptitude and interest. Further, progressed learners (those who have been progressed with a fail in Physical Science since Grade 10) create problems. Progression especially in township schools perpetuates poor quality results. These two categories of learners put pressure on Physical Science teachers because the provincial education department requires an increase in the number of learners passing Physical Science with minimum requirements. One teacher indicated that the focus is predominantly on poor performing schools and progressed learners put a strain on teachers and this makes them despondent.

Teachers feel that the department’s focus with regard to Physical Science is not based on quality teaching but rather on increasing the number of learners passing the subject. This frustrates teachers and contributes to poor quality teaching.

(b) Data analysed on challenges impacting Physical Science subject advisory

The challenges presented by subject advisors were more than those presented by school principals and Physical Science teachers. The challenges presented by school principals and teachers were similar to each other or to those presented by subject advisors. The table below presents challenges according to participants responses.

Table 4.10: Challenges on Physical Science subject advisory

Participants who presented challenges	**Common challenges**
Subject advisors and teachers	• Content and pedagogical content knowledge of subject advisors • Teacher unions • Pressure to produce good results with weaker learners: Progression policy • Commitment of teachers
School principals and teachers	Personal relationships between teachers and subject advisors: attitude of subject advisors
Subject advisors and school principals	Frequency of school visits
Subject advisors only	• Undefined roles, Capacity of subject advisors, Lack of collaboration within districts • Poor curriculum management by school principals, misuse of norm time, wrong placement of teachers, lack of accountability by teachers, learner unions

The summary of the challenges indicate that common challenges identified by subject advisors and teachers are directly related to teaching and learning, those presented by school principals and teachers are related to interpersonal relationship with teachers and those presented by subject advisors and principals are related to the frequency of support through school visits. The challenges that were only presented by subject advisors related to the department of education and management of principals which is predominantly administrative.

4.5.2 POSSIBLE SOLUTIONS TO THE CHALLENGES

Subject advisors, school principals and Physical Science teachers were asked to suggest way in which challenges encountered by subject advisors in curriculum support can be reduced. The diagram below shows the procedure followed in collecting their responses.

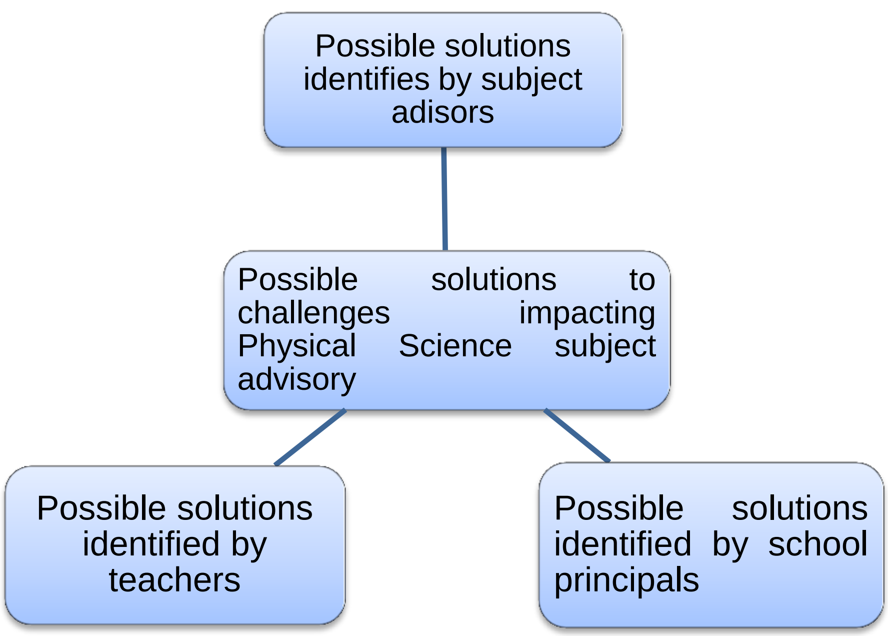

Figure 4.10: Possible solution to challenges impacting Physical Science subject advisory

4.5.2.1 Possible solutions identified by subject advisors

Subject advisors suggested activities that could be implemented by the national department of education, provincial departments of education, school principals and Physical Science teachers.

(i) Possible solutions on support by the Department of Education

(a) Neglect of subject advisors

Subject advisors recommended increased support by teacher development units in providing funds or by NGO's in training subject advisors. One subject advisor suggested that bi-monthly provincial subject meetings should focus predominantly on content support for subject advisors who have content limitations. A positive existing practice among subject advisors is the sharing of content, common tests and examination papers in their districts. However, some subject advisors remain passive, do not bring material to share and never volunteer as provincial examiners.

(b) Undefined roles

On undefined roles, subject advisors agreed that there is much room for improvement in defining the roles of SESs as well as their workloads. A subject advisor said:

We need to be on top of our subject knowledge. We need to have space to guide our teachers without any interference from other units that take up our time. We need to understand the teacher very well and support them on an individual basis. The reporting *on compliance is not as important as support on content and didactic knowledge and skills improvement.*

Subject advisors argue that in improving these roles, one should revisit their roles in all subjects and compare the work load. Policy should specify roles for district officials per unit to avoid burdening subject advisors with non-curriculum related tasks. Subject advisors should not only seek teacher compliance but also professional improvement and they need sufficient time to support teachers with subject related issues.

(c) Education policies

On the progression policy, subject advisors differed. Some felt that learners should be screened in Grade 10 according to aptitude in Physical Science. Progressed learners have now become a priority; this compromises quality results since the focus is on ensuring that progressed learners attain minimum requirements to the neglect of other learners. The other subject advisor argued that the screening learners cannot be used as a measure to categorize learners according to aptitude given that some learners may not have been taught by a teacher who has the correct competency in the Physical Science part of Natural Science. Two subject advisors indicated that based on the competency of some Physical Science teachers, one cannot screen learners if one is unsure whether the poor learner performance is a result of poor teaching or lack of aptitude. As a result, the progression policy should remain. One subject advisor indicated that in 2016, progressed learners from Grade 11 who had failed Physical Science passed Grade 12 Physical Science; some with distinctions. She also argued that in some schools the Grade 12 teacher is a highly competent teacher and is able to pass learners in Grade 12.

(d) Capacity of Physical Science subject advisors

The suggestion by one subject advisor on the uneven distribution of schools in the districts was that it should not be a blanket decision of allocating all districts two Physical Science subject advisors. He suggested a ratio of one subject advisor to 20 schools be applied. This can be done by merging education districts in a region and redistributing the number of schools accordingly. Subject advisors indicated that outside projects and new subjects take up much of their support time for Physical Science. They recommend that all projects be handed to special projects and that new subject advisors should be appointed for the new subjects even if this subject is closely related to Physical Science. They also want other units to take up their responsibilities and stop shifting them to the curriculum unit.

(e) Lack of collaboration

Subject advisors suggested collaboration within district officials in a district and at the provincial levels. The district directors should involve the district DCES when formulating plans to support schools. Many units at the district office can take some responsibilities that do not require curriculum support such as collection of term stats and projects. The stats and coordination of projects do not benefit curriculum support although they are related to Physical Sciences. They also indicated that the interference of cluster leaders in their planning is very irritating and should be clarified by the district directors.

(ii) Possible solutions on support by school principals

(a) Acceptance of subject advisors in schools

Subject advisors object to being barred from lesson observation which is part of their duties during school visits. One subject advisor argued that in one school there are teachers who are members of diverse teachers unions but when one union prohibits lesson observations, some school principals regard this as policy. In most cases the principals who agree to such decisions are the ones whose management of the curriculum is unacceptable. Subject advisors feel that education management decisions should be made only by the DoE and not by a single teacher union.

(b) Curriculum management

Subject advisors would like to see principals getting involved in curriculum matters especially in supporting Physical Science teachers. School principals should ensure that Physical Science teachers have sufficient teaching resources and support by principals who monitor Physical Science teaching in a school. School managers should implement circular 38 of 2007 to discover what is happening with curriculum matters at the school. The argument is that if the reporting processes are followed, subject advisors, who sometimes visit a school once or twice a month, will not discover content gaps or omissions when he/she visits a school which school managers know nothing about. They also want school principals to hold Physical Science HoD's accountable for quality teaching and results instead of shifting that responsibility to the subject advisors.

(c) Misuse of norm time

Subject advisors want school principals to ensure that the time allocated for Physical Sciences is adhered to and that even when the timetable is correct according to policy documents, teachers should use the time effectively to teach and assess learners. The excursions taken during school time should be minimal and the time used by schools during common examinations and tests should be managed. Subject advisors want school managers to ensure that teaching and assessment continues even during the writing of common tests and internal examinations.

(d) Wrong placement of teachers

The challenge of wrong appointments and wrong placement of teachers seem to be a long time problem. Subject advisors indicated that school managers place teachers in grades according to their qualifications, commitment and competence. These findings correlate with those of Bernstein and Hofmeyr (2015) who attribute poor curriculum delivery in some South African schools to placement of teachers in posts that do not correspond with their teaching qualifications or subject specialization (section 2.3.4). Some subject advisors agree with the rotation of teachers from Grade 10 to 12 to give all teachers experience of teaching Grade 12. Others indicate that rotation, where teachers are not equally competent, results in inconsistent results in consecutive years: when the weaker teacher takes over from a stronger teacher, results drop. One subject advisor suggested that the placement of teachers in a school should be done with HoD or subject advisor if possible, based on the performance of learners taught by each teacher.

(iii) Possible solutions on support by teachers

(a) Accountability

Subject advisors suggested that school managers hold teachers accountable for their teaching and assessment practices of Physical Science throughout the year and across all grades from Grade 10-12. They argued that the inability of school principals to hold teachers accountable, waiting only for the district officials to ask teachers to give an account of poor results perpetuates underperformance since teachers do not have to answer to immediate authorities.

(b) Commitment

Subject advisors indicated that intervention by teacher and learner unions and policy related issues are beyond their jurisdiction. Subject advisors indicated that teachers should prepare well for their lessons, teach and assess well. Although the issue of progressed learners is tricky, this cannot always be used as an excuse. Further, all learners commence with Physical Science in Grade 10 and screening does not necessarily imply performance will be addressed. In most cases learners, who perform poorly in Physical Science in one school or class, perform better in another school or class under more competent teachers.

The argument of progressed learners was presented to subject advisors by the Director General for the DoBE. The presentation indicated that of the 7 404 learners progressed from Grade 11 to 12 who wrote seven subjects, 4 519 passed Grade 12 in 2016 (DoBE, 2017b). The question raised in favour of the motion to progress learners was that if more than 60% of progressed learners could pass Grade 12 in the first attempt, who is incompetent - the learners or the teachers? Other subject advisors argue that even in schools where there are good teachers who produce results, there are learners whose aptitude in Physical Science is very low and they barely pass the subject or fail it.

4.5.2.2 Possible solutions identified by school principals

Only one of the four sampled school principals indicated some room for improvement on activities of subject advisors, the rest indicated that the subject advisors were doing enough. The above-mentioned principal recommended subject advisors to reduce paper work and planning activities with teachers at the beginning of the year and improve personal relationships with teachers. Some school principals indicated that the department should stop putting pressure on subject advisors whilst they progressed learners to Grade 12, predominantly Physical Science learners. The pressure on the subject advisors to pass learners in Grade 12, when they have not even passed grade 10 Physical Science is transmitted to teachers. One principal indicated that intervention strategies to improve learner performance would be effective if Secondary Schools Improvement Plans (SSIP) classes were conducted by Physical Science subject advisors rather than teachers whose competence is questionable.

4.5.2.3 Possible solutions identified by Physical Science teachers

Teachers recommended good interpersonal relationship with subject advisors, improvement of content and pedagogical knowledge of subject advisors, teacher commitment and reduction of pressure to produce good results.

(i) Interpersonal relationships with subject advisors

All participating teachers indicated that they would like to have good interpersonal relations with subject advisors because they need them to support them effectively. The teacher with a poor relationship with the subject advisor acknowledged that the subject advisor provided support content material for teaching and assessment. This teacher wished to improve the relationship and her attitude in the interests of teaching quality. Poor relationships between the teachers and the subject advisors are due to misuse of power by the subject advisor. One teacher said:

> *T6: Sometimes subject advisors do not understand when teachers have challenges. They force teachers to do the impossible things and this is why they are rejected.*

Teachers requested for positive feedback from subject advisors after school visits instead of complaints to school principals. They indicated that they would appreciate good professional relations and not harassment. One teacher's response to suggested improvement strategies was:

> *T5:"When there are complaints, these should be handled professionally, first with the HoD then the principal."*

(ii) Content and pedagogical content knowledge of subject advisors

Teachers want content support on both Chemistry and Physics to be effective. One teacher indicated that his subject advisor should improve equally in both Chemistry and Physics. Teachers acknowledge that subject advisors have adequate knowledge but would like the subject advisors to learn from them as well. All teachers indicated that they require support with compliance of the Physical Science curriculum but require more support with content and pedagogical content knowledge. A teacher said in this regard: "*He has to be more open, more flexible, supportive with Physics."*

(iii) Commitment of teachers and pressure to produce results with weaker learners

Teachers understood the need for commitment to their work but argued that sometimes the pressure to produce good results with poor performing learners renders them incompetent. They wish the progression policy to be cancelled and the curriculum reduced because it is too packed.

4.6 SUMMARY OF THE FINDINGS

The summary of the findings showed the relationship between data collected under the same topics to show differences or similarities. At the end a comprehensive summary showed the integration of all data used to answer the primary question through secondary questions. The summary followed the same order in which data was collected which is qualities of subject advisors, content and pedagogical content knowledge of subject advisors, curriculum delivery management and skills and challenges and possible solutions for subject advisory. Figure 4.11 indicates the framework depicting roles of subject advisors.

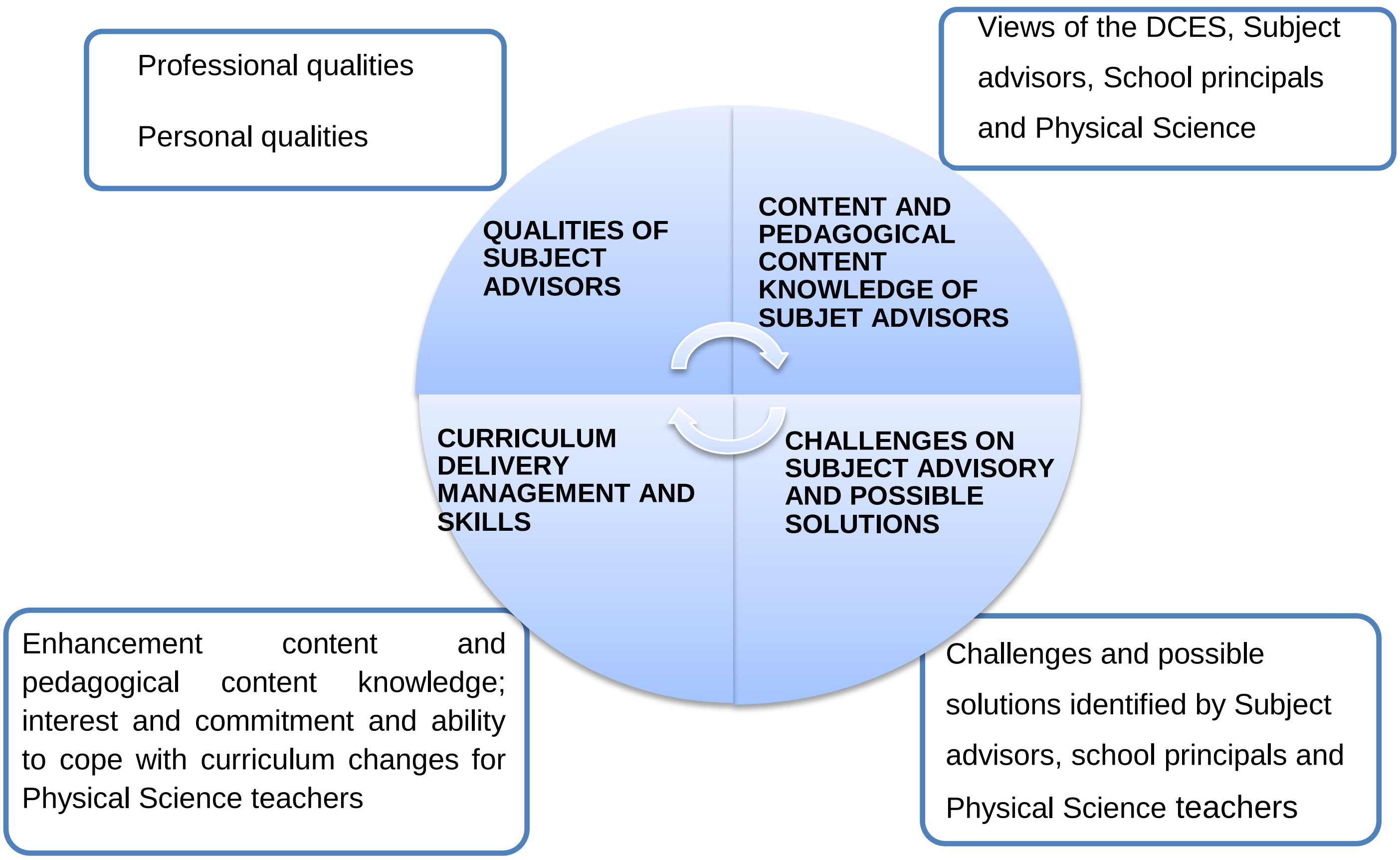

Figure 4.11: Framework depicting expected roles of subject advisors from findings

4.6.1 Qualities of subject advisors

4.6.1.1 Professional qualities

The factors that the researcher used to determine the expected qualities of subject advisors were: professional qualities (qualifications, experience and competence) as well as personal qualities. All Physical Science subject advisors have the minimum requirements required for subject advisory. Although a rigorous selection exercise is employed in selection of subject advisors to stimulate confidence (Obanya, 2005), selecting subject advisors who majored in both Physics and Chemistry is impossible given the difference in the tertiary institution curriculum and the school curriculum. The challenge with qualifications of subject advisors was that not all of them had a professional qualification with specialization in both Chemistry and Physics. In addition, some subject advisors prefer Physics to Chemistry or vice versa. In all cases subject advisors are expected to support teachers with both parts of the Physical Science curriculum.

The implications are that in such cases the support, help and guidance mentioned by in the path goal theory would be compromised by limited facilitative skills on Physical Science content and PCK as mentioned in the facilitative theory. The findings on qualifications of subject advisors concur with arguments by Parker (2011) and Okoro (2004). Parker argues that the type of qualifications possessed affects performance. Professional qualities (qualifications and experience, competence and content knowledge + PCK) mentioned in section 2.4.1, are interrelated. Qualifications affect the competence of subject advisors and consequently the quality of support offered to teachers. Ozdemir and Yirci (2015) relate competence to excellence. The facilitation theory inter-connects subject knowledge with pedagogical content knowledge (PCK).

Then Ozdemir and Yirci (2015) continue to emphasize the importance of professional competencies and effective communication. Glickman, Gordon and Ross-Gordon (2005) concede that competence implies possessing a knowledge skill base, interpersonal skills and technical skills. Subject advisors have the task of helping teachers to improve on what they know, teaching skills, as well as their ability to make more informed professional decisions (Sergiovanni & Starratt, 2007). With regard to competence of subject advisors, the outcomes are measured by improved teaching practices of teachers they support. Teachers and school principals who considered their subject advisors to be competent mentioned that subject advisors carry out activities embedded in knowledge, interpersonal and technical skills as mentioned by Glickman, Gordon and Ross-Gordon (2005).

Subject advisors who indicated their strength in one part of the Physical Science content also indicated the need for professional development, which they mentioned that it was not available. Okoro (2004) adds that educational personnel with higher qualifications display more confidence in their workplace. The responses of individual teachers and PLC groups on the content and pedagogical content support received from subject advisors correlate with those of subject advisors on either their content limitations or preferences. Qualifications affect the type of content and PCK of support received by teachers. If the qualifications do not cater for both Physics and Chemistry or is they prefer one of the two, this compromises the support for quality teaching for the overall Physical Science curriculum.

In all cases where teachers indicated that the subject advisors leaned to one part of the Physical Science curriculum, the weaker or the less preferred part was where they required assistance. In this study teachers who indicated satisfactory support in content and pedagogical content knowledge and improved quality teaching are those whose subject advisors have high qualifications, have taken an initiative to improve content and pedagogical content knowledge through research or further study, have a balanced knowledge of Physical and Chemistry or do not lean towards one part of the Physical Science curriculum. Such subject advisors fit the description of leaders identified in the path goal leadership style (Section 2.2.1.3). They are supportive and directive. The supportive approach is best when the work is stressful as is in the case of ensuring that quality teaching is attained for a subject who has a history of underperformance like Physical Science in South Africa. Directive leadership involves letting subordinates know what is expected of them, giving clear guidelines, and making sure they know the rules and procedures to get the work done.

Qualifications of subject advisors suggest that Physical Science subject advisors are in a position to carry out their jobs at an acceptable level, but also support the argument of Bernstein and Hofmeyr (2015) that their qualifications alone do not guarantee effectiveness. With regard to experience, Harris and Sass (2007) indicated that effectiveness grows over at least five years in a job. Physical Science subject advisors whom teachers identified as offering the required support could do so because on the confidence gained through knowledge acquired over the years. These subject advisors have made quality information accessible to teachers, and adapted to curriculum changes compared to their counterparts with lower /part qualification, who are usually more indisposed and ill-equipped in adapting to modern changes (Okoro, 2004).

4.6.1.2 Personal qualities

Personal qualities alluded to by participants includes the *good* attitude and empathy, feedback as opposed to criticism. Subject advisors' support to teachers involves face to face sessions which involve direct communication with teachers and school principals (Nkechi, Umemetu & Ogbonnaya, 2013). The relationship between the subject advisors and teachers is a crucial element for an effective curriculum support. Findings revealed that teachers and principals who have a good rapport with subject advisors are not afraid to disclose challenges to them, showing trust in subject advisors. Those that did not indicate sound relationship are not confident that subject advisors are knowledgeable. A teacher indicated: “I think he is trying to hide his weakeness”. They also prefer subject support from peers rather that heir subject advisors.

When the supervisors’ attitude towards work and school is positive, teachers are more likely to be satisfied with and interested in their work. Literature indicates that heads of the school and staff members alike prefer working with someone who has a positive attitude (Samuel, 2006). Unhealthy relationship between the teachers and the subject advisor affects the confidence of teachers in the support rendered by the subject advisors. A successful supervisor has a positive attitude (Tesema, 2014).

4.6.1.3 The relationship between professional and personal qualities

Personal qualities of subject advisors cannot be isolated from professional qualities required in the day to day work of advising. Supervision is a formally designated behaviour system that interacts with the teacher behaviours system in order to improve the probability that the goals of teaching will be achieved (Orenaiya, Adenowo, Aroyeun & Odusoga, 2014). According to Nkechi, Umemetu and Ogbonnaya (2013), it is a way of advising, guarding, refreshing, encouraging, stimulating, improving and overseeing cooperation in order for the supervisor to be successful in supervision. For this a good relationship is required between the subject advisors and the teachers; however the relationship stems from the personality of the subject advisor. Subject advisors indicated that they understood that a good relationship with teachers can improve quality of teaching. Attitude was a hallmark of what contributes to a good or a bad relationship.

Although responses of subject advisors interviewed correlated with those of the principals and teachers on healthy acceptable relations between subject advisors and teachers, an exception related to the often-mentioned poor interpersonal relationship between teacher and the subject advisor was cited by principal and the teacher in separate interviews unbeknown to each other. Principals and teachers who indicated that their subject advisors had positive attitudes towards them, were receptive towards the support by the subject advisor and this led to improved teaching quality. On the contrary, if the teacher/principal interpreted the attitude of the subject advisor as negative, interpersonal relations were not acceptable and the support was not well received. In the single exceptional case of a poor teacher-subject advisor relationship, the teacher and the principal had resorted to asking for help in Physical Science curriculum matters from a neighbouring school. The principal and the teacher do not view the behaviour of the subject advisor as acceptable so he is not perceived as an immediate source of job satisfaction (De Caro, 2005).

4.6.2 Content and pedagogical content knowledge of subject advisors

4.6.2.1 Views of the provincial DCES and subject advisors

All participants including subject advisors felt that content and pedagogical content knowledge of subject advisors was on an acceptable level albeit with some shortcomings. The response of the Physical Science DCES on the content and pedagogical content knowledge of subject advisors was not clear because her response was based on all subject advisors in the province. Although all subject advisors indicated that they have the necessary content and pedagogical content knowledge required for their job, they also mentioned shortcomings related to their area of specialization in Physical Science and their preferences. This explains why some teachers still lack specialist content knowledge and are reluctant to implement inquiry-based teaching strategies in their classrooms (Ramnarian & Fortes, 2013), because they emulate their subject advisors.

Some subject advisors indicated that they are confident to support teachers for from Grade 10-12 although they spend more time supporting the Grade 12 teachers. School principals did not register any dissatisfaction to the content and pedagogical content knowledge of the subject and one mentioned that when it comes to curriculum issues, he asks for the assistance of the subject advisor since his specialty is not in Physical Science. None of the sampled school principals sampled was a former Physical Science teacher nor are they involved in Science education professional development to help teachers develop professional communities, connect teachers with resources, encourage and support changes in practice as suggested by Halverson, Feinstein and Meshoulam (2011).

As a result their responses do not indicate a fair understanding of the value of Science program, the resources needed for teachers to enact the change in practice, and give them the opportunities to plan and reflect upon how to support the intended changes in their particular contexts (Spillane, Halverson, & Diamond, 2001). They indicated that subject advisors conduct content workshops, PLC meetings and provide support teaching and learning material as evidence that they have sufficient content and pedagogical content knowledge.

4.6.2.2 Views of principals and Physical Science teachers

Principals' responses on the content and pedagogical content knowledge were based only on their observation of the reactions of teachers towards subject advisors. If there were no complaints to them it meant all as well. They were however aware that there were content workshops held and Physical Science support material provided to assist teachers. The responses of individual teachers interviewed and PLC groups were similar on the content and pedagogical content knowledge of teachers. For the same district office, some teachers indicated maximum satisfaction in the content and pedagogical content knowledge of either both subject advisors, or one of them. This matter in all cases where dissatisfaction was registered was mainly because teachers observed that some subject advisors leaned to one part of the Physical Science curriculum.

Vieluf, Kaplan, Klieme and Bayer, (2012) argue that effective professional development should focus on subject matter knowledge, be grounded in a common set of professional development standards and show teachers how to connect their work to specific standards for student performance. Cobern, Schuster, Adams, and Skjold, (2013) add that an important goal for Science teacher education is to acquire knowledge of Science teaching pedagogy. Physical Science workshops focused on content and pedagogical content knowledge for subject advisors who conducted them with that intent. The one issue where teachers indicated that their subject advisor did not support them was on specific content and only provided compliance with CAPS curriculum on generic subject issues. The responses of teachers indicated that there is a need for the improvement of content knowledge required for Physical Science subject advisors as curriculum supporters.

4.6.3 Summary of findings on curriculum delivery management and skills

4.6.3.1 Impact of support in content and pedagogical content knowledge of subject advisors in enhancing the quality of Physical Science teaching

Physical Science subject advisors are individuals who are intimately involved in the administration and execution of leadership activities associated with curriculum and instruction (Spillane, Camburn, & Stitziel, 2007). The support and development offered should translate into improved teaching quality and improved Physical Science learner performance. Physical Science subject advisors are accountable for the performance of Physical Science in all schools in a district. Honig and Copland (2008) argue that student learning suffers when central office administrators do not provide needed support for teachers. Instructional process and supervision for Physical Science in the sampled districts have not helped in improving academic performance of learners as should have been the case (Dangara, 2015).

While subject advisors indicated positive change in teaching quality and the confidence of Physical Science teachers after receiving support and development through school visit activities and content workshops, a fragment of teachers indicated that they did not receive content support from their subject advisors but from those of other districts and peers from neighbouring schools. Others indicated some content limitation in either Physics or Chemistry, which correlates with previously mentioned findings in this regard. Those whose teaching quality has resulted to an increase in learners' performance confirmed findings by Whitworth and Chiu (2014) that districts with successful student performance on standardized tests had superintendents who were actively involved in the development and implementation of curricular reforms and structured district control with school autonomy.

To those who improved teaching quality but did not improve learner performance confirm Luft and Hewson's view (2014) that while professional development can help teachers become more effective and benefit their students, not all professional development results in teacher change, and very few link to student outcomes (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). In some cases where teaching quality has improved but learner performance has not, teachers mentioned internal conflicts, interruption of teaching by learner unions and progressed learners to be major contributors to poor learner performance. Findings indicate efforts to increase teachers' content and pedagogical content knowledge by the provincial DoBE, to increase the efforts of subject advisors and to fill gaps of those that do not offer content support. Some teachers indicated that they attend provincial teacher development workshops which help with Science content.

4.6.3.2 Impact in improving Physical Science teachers' interest and commitment

Subject advisors mentioned that teachers' interest and commitment in Physical Science were aroused by exposure to Science expos, alternative teaching methods such as the use of ICT and providing extra teaching and assessment resources. However they mentioned the need for teachers to be self-motivated. The other factor that was indicated as a contributing factor to improved interest and commitment to Physical Science teaching was a good relationship between the subject advisor and teachers.

4.6.3.3 Impact in assisting teachers to cope with curriculum changes

The changing curriculum has presented a need for teacher development but subject advisors indicated that the current CAPS curriculum has not changed since its inception in 2012. This has allowed teaching quality to improve over the years. The challenge with coping with the curriculum changed is that some of the teachers who were coping with the changes have been promoted to management positions. This created the need for constant support of teachers which subject advisors said they ensure that it is done through conducting experiments and providing teachers with work sheets, additional support material and power point presentations.

4.6.3.4 Impact on Physical Science learner performance

Subject advisors, principals and teachers have indicated that there are improvements in the teaching quality but the pass rates of the sampled districts have not consistently improved from 2014 to 2017. In addition subject advisors and teachers also indicated that the improved teaching quality has not translated to improved results. All sampled subject advisors have the required qualifications to support Physical Science teachers but this has not impacted positively on the learner performance. This concurs with Bernstein and Hofmeyr (2015) who argue that a qualified teacher is not necessarily a good teacher (section 2.8.5.4).

4.6.4 Summary of challenges impacting on subject advisory

4.6.4.1 Challenges identified by subject advisors

(a) Challenges from the department of education

Subject advisors mentioned challenges that emanate from the department of education directly affect the quality of the support rendered by subject advisors. In return this affected the support received by Physical Science teachers and ultimately the support received by Physical Science learners. Findings on the issues mentioned by subject advisors affect content and pedagogical content knowledge are summarized in this way:

- Neglect of subject advisors affect the content and pedagogical content knowledge of subject advisors and hampers their confidence in effectively carrying out their duties. This results in them not being able to effectively provide such to teachers.
- Undefined roles and Capacity of subject advisors increases the work load of subject advisors and reduces the amount of time spent in the Physical Science subject support which reduces the time for support for teachers.
- Education policies (the progression policy) put emphasis on the quantity of Physical Science at the expenses of quality, causing a perpetual trend of poor quality results of Physical Science.
- Lack of collaboration adds to the workload of Physical Science subject advisors since the information required

The common repercussion of the challenges from the department of education is ineffective Physical Science curriculum support due to lack of professional development of subject advisors, consumption of contact time and overload of activities for subject advisors. Most activities such as school readiness and counting of furniture take place at the beginning of the year or each term when the teachers need to support the subject advisors most. These activities delay the period to start with curriculum support at schools which means that by the time the subject advisor start with school visits, challenges that could have been avoided if support started earlier have already been done.

These undefined, inconsistent roles of subject advisors in different districts have made teachers to question the effectiveness of subject advisors. Subject advisors explained that where curriculum support is not given as expected, they come to be viewed as school inspectors as in the past because of the time spent on unrelated issues. One subject advisor indicated that subject advisors cannot perform their normal school support duties when other activities are demanded from them.

(b) ***Challenges from school principals***

Subject advisors cited the acceptance and cooperation of school principals in assisting with overall management of Physical Science teachers as a factor which assists them in effectively providing support to improve the quality of teaching. If principals work together with them, the results are positive. However, this is not true in all instances. Decisions by some principals were identified as a cause of challenges in subject advisory because of their inability to discipline learners, lack of support for teachers, refusal to allow subject advisors conduct classroom visits, wrong appointments or placement of Physical Science teachers, ignorance of the developments of Physical Science in the school and lack of follow up on subject advisors school visit reports. They indicated that these activities are evidence of lack of interest in Physical Science and neglect of Physical Science teachers.

The refusal to allow subject advisors to perform class visits in order to moderate content and pedagogical content knowledge of teachers means that some principals carry out the mandate of teacher unions and not those of the provincial department of education. Table 2.1 indicates classroom visits by subject advisors as one of the core duties of subject advisors. In addition, teachers are affiliated to different teacher unions, some of whom may not have challenges with class room visits. The principal as a manager of the school is also tasked to ensure that all teachers' rights are protected within the school premises. Refusal for subject advisors to conduct classroom visits implies that the principal prefers that the principal prefers resolutions taken by one teacher union to the others.

Principals whose attitudes are negative towards subject advisors do not understand the importance of supporting Physical Science teachers. Misuse of norm time and wrong placement of teachers indicate that principals do not possess full information about the school system and instructional and management strategies that can strengthen the teachers' capacity to cope with classroom problems (Oyewole & Ehinola, 2014). The consequences as identified are poor teaching quality, leading to poor learners' performance in the subject.

(c) Challenges from teachers

Findings about challenges encountered from teachers include the denial of teachers to take responsibility for poor learner performance. Subject advisors attributed difficulties to improve teaching quality to teacher lack of commitment and accountability. The lack of commitment to effectively teach and assess Physical Science teaching adds to the challenges when teachers do not allow subject advisors to assist them with pedagogical content knowledge through classroom visits.

(d) Teacher and learner unions

Subject advisors indicated their frustrations on the refusal by a certain teacher union to conduct class visits and common tests and exams. They cited the refusal as a rejection for teacher development. Subject advisors refute the explanation that the HoD's will perform the development. The issue of learner unions was indicated as a deterrent to learning due to the disruption of classes however it was also indicated that the matter was beyond principals and teachers. The blanket decision to overrule other unions within school in order to accommodate one teacher union teacher union's decision means that other teachers and principals are forced to oblige by the decision of others even if they do not want to.

4.6.4.2 Challenges identified by school principals and teachers

School principals and teachers related the inability to improve teaching quality and learner performance to the poor content support received by teachers which they attribute to limited content knowledge and negative attitude of some subject advisors. The attitude (as one teacher said, "He wants me to be like him") is perceived by teachers as control rather than support. The role of subject advisors is to support teachers with Physical Science curriculum matters, not to control them. Win (2010) explains control as a process to find out deviations between planned performance and actual performance and to suggest corrective measures or actions, whereas support is in most cases characterized by advice given to teachers by their supervisors. Findings for this study also indicated that teachers are pressurized to increase the number of learners passing Grade 12 by ensuring that progressed learners pass.

The cycle of control and policy compliance tend to school inspection as it used to be. Sergiovanni and Starratt (2002) indicate that supervision used to be carried out to eliminate present or possible failures in the education system, determine whether educators master their professional duties and responsibilities and to prevent educators from making mistakes. Findings from individual interviews and focus groups on challenges that subject advisors have with content and pedagogical content knowledge in Physical Science correlated. Teachers who indicated that they do not receive content support either during school visits or at subject meetings concluded that the lack of support is because of the limited content knowledge of subject advisors. Their preference for support in one part of the Physical Science content was clear to teachers and they could tell the strengths of the subject advisors. Unfortunately teachers indicated that these limitations affect the quality of their teaching as well if they do not improve.

4.6.5 Summary of findings on possible solutions

All possible solutions presented by subject advisors, school principals and Physical Science teachers centered around the need for improving the quality of Physical Science teaching through sufficient subject knowledge with the aim of improving Physical Science learner performance. Subject advisors indicated the need for consistent, effective professional development so that in return they can also offer effective consistent professional development for Physical Science teachers. Stein and D'Amico (2002) views subject advisors as professional learning laboratories; while Grossman, Thompson and Valencia, (2002) views them as teacher educators who should provide guidance about what and how to teach. Subject knowledge of subject advisors translate to competence which was another issue that teachers were concerned about.

Teachers felt that subject advisors are not competent because of limited content knowledge. They want more support on content and pedagogical content knowledge to improve the quality of their teaching. Alimi and Akinfolarin (2012) argue that student performance greatly depends on the quality of instruction and education received in school. Lack of support can exacerbate teachers' misconceptions which are often transferred to their students (Bayraktar, 2009). Effective support for schools given by Physical Science subject advisors is enhanced by other factors such as clarified role support from school principals, commitment and accountability of teachers. Subject advisors require clarity on their specific roles so that they can put sufficient effort into subject support and development of teachers.

Subject advisors and teachers want more involvement from school principals in curriculum support because they play a critical role in improving Science teachers' instruction through professional development and other administrative practices which has a significant impact on student achievement (Marzano, Waters, & McNulty, 2005). Solutions suggested by principals and teachers on personal relationships indicated the desire for healthy relations between subject advisors and Physical Science teachers. This concurs with Memduhoglu (2012) that priority should be placed on the strong cooperation between the subject advisors and Physical Science teachers. School principals and teachers want the subject advisors to be supportive and not revert to old school inspection practices such as checking compliance to policy documents.

The factors investigated about subject advisors affect the nature of support and development and have an effect on the teaching quality of Physical Science teachers as shown in the diagram below:

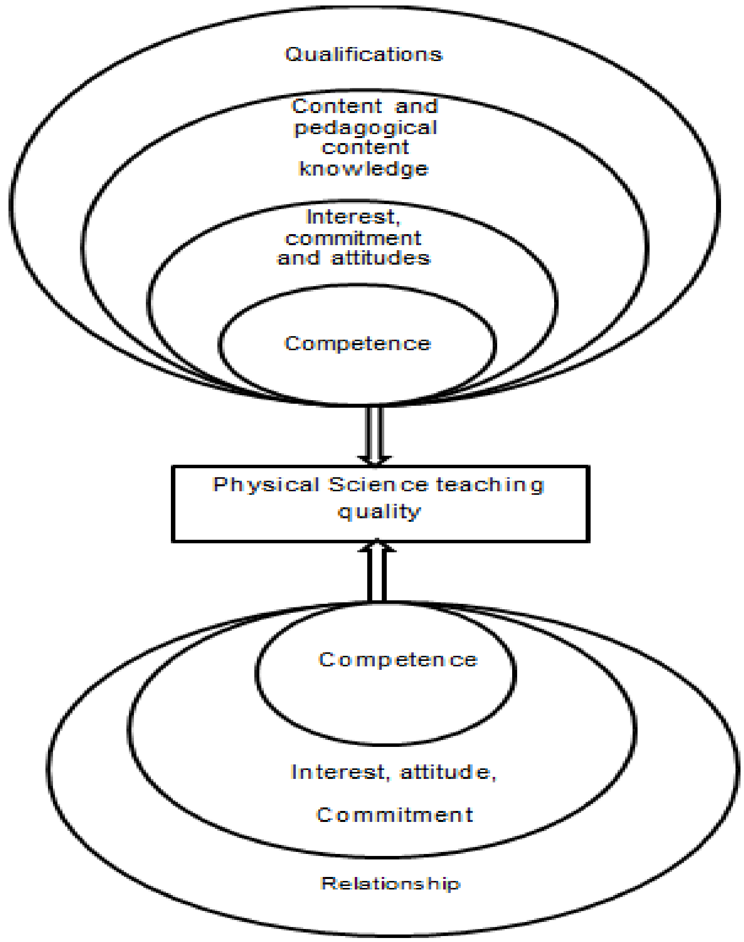

Fig 4.12: Interrelatedness of factors impacting of teacher quality

4.7 CONCLUSION

This chapter presented data collected about the roles subject advisors from the DCES, subject advisors, principals and Physical Science teachers. Findings were triangulated with the theoretical framework and the literature review for this study. Data were collected on challenges that can hamper effective curriculum support of teachers and possible solutions. The same participants were involved in both the qualitative and quantitative components of this study. The next chapter presents the summary, recommendation and conclusions drawn from this study.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter presents conclusions drawn from the study on the roles of subject advisors to enhance the quality of teaching Physical Sciences from the literature reviewed and findings in an attempt to address the primary question of this study through evidence presented by answers to the secondary questions. Recommendations are directed to the DoBE, provincial education departments, district offices, school management teams and Physical Science teachers for better management of Physical Sciences in schools, improved teaching and assessment practices and quality Physical Science results. Preventive measures to existing practices that deter effective support are also discussed. This chapter also presents implications for future study.

5.2 THE FINAL REPORT

The study on the roles of subject advisors focused on the four aspects which are intertwined for curriculum support: qualities of subject advisors, content and pedagogical content knowledge and curriculum delivery management and skills of subject advisors and challenges and solutions for Physical Science subject advisory.

5.2.1 Qualities of subject advisors

The qualities of subject advisors as discussed in section 2.5 are categorized into the professional and personal qualities. Personal qualities required from subject advisors incorporate the aim of the path goal theory (section 2.2.1), which are to support, guide and help Physical Science teachers. They are reinforced by the attitudinal qualities of the facilitative theory (section 2.2.2), which are realness (being aware of other people's feelings and the ability to communicate them appropriately), prizing, acceptance and trust (which involve caring about the teachers and accepting their feelings) and empathy (which means being able to *walk in another's shoes)*.

These qualities determine the type of leadership used in supporting Physical Science teachers. The facilitative theory guides activities that are performed by subject advisors which can be done through school visits and facilitating the content and pedagogical content knowledge. The goals setting theory from the path goal theory emphasize the importance of setting challenging but realistic goals; however the goals are aimed at improving Physical Science teaching quality which has an impact on the performance of learners. For the goals to be attained, the expectancy theory provides an explanation on why subject advisors work hard to attain work goals. Goals set for improved teaching quality are monitored through school visits and the expectations are that commitment to the attainment of these goals will improve Physical Science teaching quality.

The level of support offered by subject advisors is influenced by the type of Physical Science qualifications that they obtained at a tertiary institution. If subject advisors have a Physical Science qualifications comprising of Physics and Chemistry, the support is more effective compared to when the qualification is based on one part of the subject. The lack of full qualifications can be supplemented by professional development programs of subject advisors but it was discovered that there were none. Qualification of Physical Science subject advisors explained certain observable trends in the performance of Physical Science in the province.

The splitting of the Physical Science into Physics and Chemistry versus the combination of the two at schools for the same workforce that do not have the competence to teach both has created a gap to the quality of Physical Science education leading to the status of the results as it is. The matter is perpetuated by the preference of one of the parts of Physical Science even to those who have majored in both. The results are unreliable and non-resilient Physical Science education practice which engenders confidence among teachers and students as a result of effective and professionally coordinated learning. The type of content support that teachers receive from subject advisors correlat with those of subject advisors based on qualifications or preference. On-going professional development is important to improve subject advisors' instructional methods so that they can improve that of teachers, as well as classroom management skills of teachers, their ability to adapt to instruction to meet learners' needs, and to establish a professional culture which is important in teaching and learning.

Qualifications and experience on their own cannot be sufficient for a mammoth task like curriculum support. Subject advisors carry a professional mandate of ensuring that effective teaching and learning takes place. The focus of subject advisory on effective curriculum delivery cannot separate the personal qualities from professional qualities required to enhance the roles of subject advisors. Effective curriculum support requires good relations between subject advisors and teachers. The path goal theory stresses the importance of interpersonal relations. It indicates that a supportive leader motivates the subordinate by decreasing negative aspects of the work environment. Good relationships between subject advisors and teachers concur with the attitudinal qualities of the facilitative theory. These qualities include realness which means that subject advisors should be aware of teachers' feelings and able to communicate them appropriately as well as acceptance and trust.

Teachers who have good relations with their subject advisors also welcome the support by the subject advisor. They prefer subject support from the subject advisor and ask for it whenever it is required. Good relations with teachers includes qualities such as active listening, mentoring, creating a supportive learning environment, providing constructive feedback, encouraging reflective practice and developing insightful or self-aware approaches in teachers. Supportive leadership alluded to in the path goal theory involves being considerate to the needs of subordinates and creating a friendly atmosphere to work in. It increases subordinates' satisfaction and self-confidence and reduces the negative aspects of the situation. Teachers who indicated improved practices when working with subject advisors whom they have a good relationship confirmed findings by Oyaya (2007) that upgrading teachers' skills requires good rapport, the collegial approach and respect for individual differences.

Unhealthy relationships between subject advisors and teachers contradict the attitudinal qualities of the facilitative theory. Teachers whose relationships with subject advisors are not healthy indicated that they are not treated professionally and with respect by subject advisors hence they also lack of acceptance and trust in them. They prefer support from other peers instead of the subject advisor and do not look forward to school visits by subject advisors. Such subject advisors were labeled by teachers as as incompetent.

The diagram below shows how qualities of subject advisors influence perceptions on their competence.

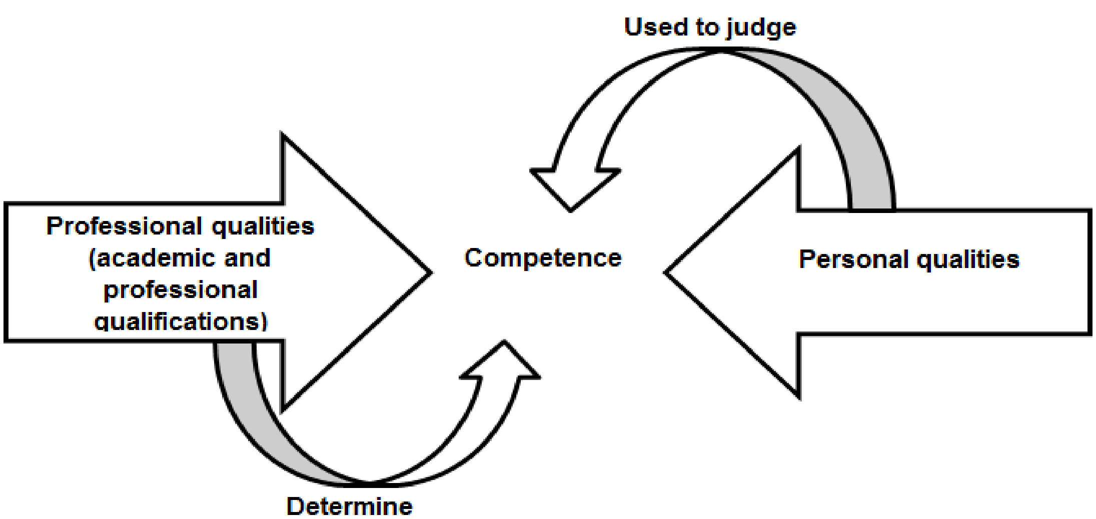

Figure 5.1: The relationship between qualities of subject advisors

5.2.2 Content and pedagogical content knowledge

Education districts are supposed to be a major provider of teachers' professional development (Spillane, 2002). This means that subject advisors should possess sufficient content and pedagogical content knowledge to assist teachers to improve teaching quality. Content and pedagogical content knowledge affects every aspect of teaching and learning, effective curriculum delivery and consequently the quality of results. The three things that affect the content and pedagogical content knowledge of subject advisors are: qualifications, professional learning opportunities and curriculum changes. They are represented in the diagram below and discussed.

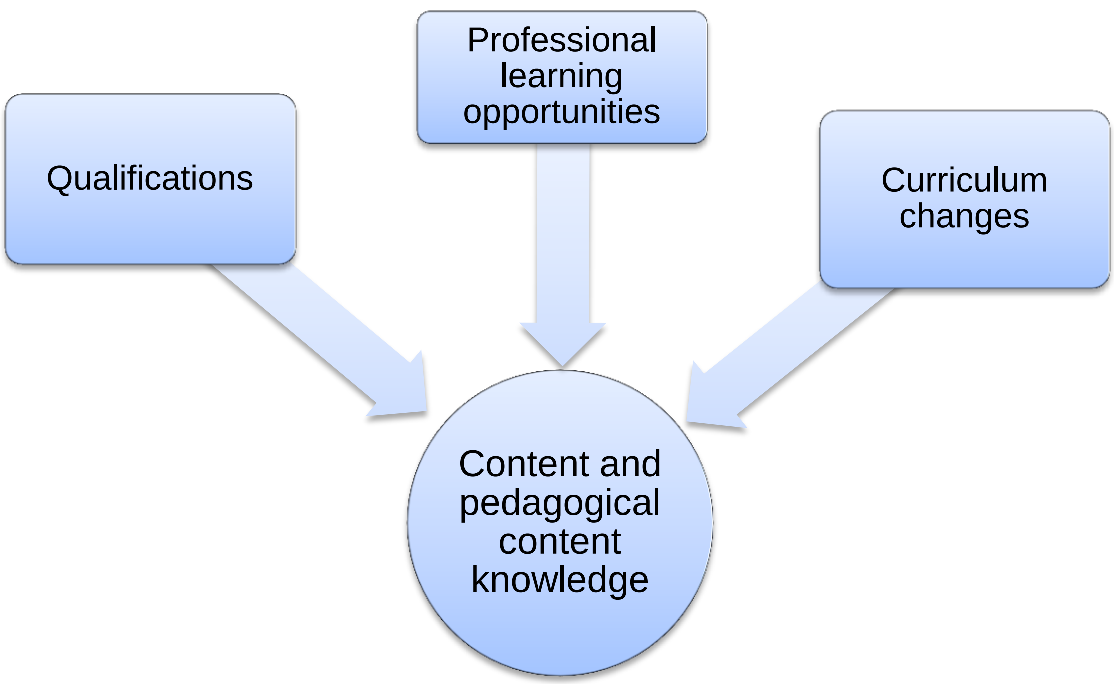

Figure 5.2: Factors affecting content and pedagogical content knowledge of subject advisors

The incorporation of Physics and Chemistry into the Physical Science curriculum in South Africa is the cause of challenges with content grasp of subject advisors, teachers and learners and will always pose a challenge until the curriculum is adapted to match the tertiary institution curriculum. Not all subject advisors and teachers have majored in both parts of Physical Science at tertiary institutions, nor are they naturally equally competent on both parts of the Physical Science curriculum. The same can be applied to learner performance in the two parts of the subject. Physical Science in the South African school curriculum consists of Physics, which is examinable in paper 01, and Chemistry, which is examinable in paper 02. The school curriculum in South Africa requires learners taking Physical Science to do both Physics and Chemistry from Grade 10-12.

Teachers have to teach both Physics and Chemistry, hence they require support and development in the entire Physical Science curriculum. It is a challenge to teachers if a subject advisor can only offer support in one part of the Physical Science and not the other or if he/she is more interested in one part of the subject. Physical Science subject advisors are tasked with the responsibility of assisting teachers with content relevant for each grade in areas where they require assistance. They are also responsible for assisting with teaching strategies that can improve understanding of content and assessment practices. Their activities correlate with those discussed in section 2.8.

The content and pedagogical content knowledge of teachers influences teacher confidence and require support from subject advisors. The Mckinsey (Mckinsey et al. 2007) report indicates that teachers are only as good as what they know. The improvement of teaching quality depends on the quality of the content and pedagogical content knowledge possessed and shared by subject advisors with teachers. Directive leadership of the path goal theory is implemented by subject advisors to support teachers through school visits, content workshops, subject meetings, feedback meetings after school visits and PLC meetings. The directive leadership involved letting subordinates know what was expected of them, giving clear guidelines, and making sure they know the rules and procedures to get the work done (Robin, 2012). As a result it has nurtured sound relationship between the subject advisor and the Physical Science teachers.

Content knowledge should always be coupled with content pedagogical content knowledge for effective quality teaching. Teachers indicated the importance of the need for support in pedagogical content knowledge in addition to content knowledge which also confirms findings of Fishman, Marx, Best and Tal (2003) who reiterated that teachers need assistance to apply pedagogical content knowledge. In the sampled province, teacher development activities comprises of content workshops for teachers of schools whose performance in Grade 12 is below 60%. The workshops take place at a central venue once every term for all affected schools and only offer support for Grade 12 teachers. Spillane (2002) and Pianta (2011) maintain that short in-service workshops with little or no follow-up often do not incorporate characteristics of effective professional development. In addition, the provincial workshops do not involve all subject advisors and attendance of all teachers, thus selective identifications always result in underperformance in Physical Science spiraling in other schools.

The evolution of education in South Africa prior the democratic election has created uncertainties and lowered the morale of many Physical Science teachers hence subject advisors are needed to assist in increasing the quality of teaching and student learning in schools. In order for the quality of Physical Science teaching to improve, subject advisors should assist teachers with curriculum change. Subject advisors are a tool to ensure that implementation of new curriculum is carried out as expected and concomitant challenges are dealt with. On the current curriculum at schools, subject advisors indicated that the support they offer to teachers has improved implementation and the quality of teaching. However, one cannot ignore the fact that sudden curriculum changes pose a challenge to the quality of support offered by subject advisors.

Existing teaching practices and the implementation of new, effective teaching practices may be affected by adjusting to recent curriculum changes. The argument was also mentioned by Donkoh and Dwamena (2014) when they mentioned that teaching practices and assessment quality have been affected by rapid global change also in education. Lack of consistent professional development for subject advisors in content and pedagogical content knowledge has affected the type of support subject advisors give to teachers in different districts and confirms findings by Desimone (2009) that professional development characterized by a content focus not only leads to increased teacher knowledge but also can lead to changes in teacher practices. Quality teaching is a collaborative activity which requires the commitment of every person involved in curriculum delivery.

5.2.3 Curriculum delivery management and skills

All literature on previous studies emphasize that the key role of subject advisors is that of the management of curriculum. It shows that consistent, relevant support by subject advisors is required to improve the quality of Physical Science teaching. The emphasis of the path goal theory on guidance, support and help correlates with their roles of district personnel which include subject advisors as well as the provincial policy of curriculum management by subject advisors (table 2.1 in section 2) on curriculum support and development as well as compliance. The intensive support for Grade 12 may be related to its status as an exit grade and the indicator used by the DoE to measure the performance of subject advisors.

The intensive support in Grade 12 does not provide a lasting solution if the Grade 10 and 11 Physical Science learners do not receive the same intensive support. This may mean that they enter Grade 12 underprepared which creates additional work for the Grade 12 teacher every year. Facilitation of the PLC meetings (the facilitation theory) are a platform for discussions on subject related issues and the facilitation of these forums by subject advisors indicate an acceptable level of Physical Science support. PLC meetings imply that the subject advisors involving teachers subject related activities that can enhance their decisions pertaining to curriculum delivery management and skills such as planning, decision-making, and execution phases. This type of leadership concurs with the participative leader of the path goal theory.

5.2.4 Challenges to subject advisory and possible solutions

Challenges that affect the quality of Physical Science teaching emanate from various factors. Challenges from the national department of education create challenges from provincial education departments which create challenges at district offices and this roll out to schools. Challenges presented by the subject advisors (neglect of subject advisors, undefined roles, education policies, capacity of subject advisors, lack of collaboration) explain why the districts do not thrive in their endeavor to support curriculum at schools and they are still not properly addressed. The challenges from the department of education are as a result of lack of clarity on the policy documents on the specific roles of subject advisors; as a result interpretation of how curriculum should be supported is left to the district managers.

The interpretation brought about by documents on roles of Physical Science subject advisors which are unclear and lead to subjective decisions on how curriculum should be supported. Lack of professional development for subject advisors leaves the quality of support to the ability of subject advisors-which may not match the curriculum needs at that time such as supporting only on what they know or are comfortable with. The roles of all district personnel are meant to improve curriculum delivery at schools, whether the support is directly or indirectly linked to subjects because learning in holistic. Subject advisors have been labeled in the guidelines documents as the link personnel who should support teachers with content and assessment; however there are districts that still expect them to do other activities which should be done by other units.

Challenges from school principals were based on poor management of schools which cascaded to poor management of Physical Science. Lack of commitment and accountability by teachers, interference by teacher unions and learners unions present challenges that can delay teaching and learning time and hamper curriculum delivery support and compromise teaching quality.

Recommendations for the study were predominantly based on solutions presented by participants for effective support and development of teachers.

5.3 RECOMMENDATIONS

Recommendations of the study based on the findings are presented to improve on the roles of subject advisors.

5.3.1 Recommendation to the national department of basic education (DoBE)

The challenges form the department of basic education are the cause for the reduced time for curriculum support by subject advisors and poor quality support.

The study recommends the following:

- Policy guidelines on the functionality of districts should specify the activities and the personnel to perform district duties (e.g. Physical Science subject advisors should be assigned duties that deal with the content, pedagogical content knowledge and assessment only related to Physical Science teaching). Other activities, irrespective of them being for Physical Science support by nature should be allocated to relevant personnel such as cluster leaders, project coordinators, data captures, assessment officials, teacher development unit etc.
- The department of basic education should consider splitting Physical Science into Physical and Chemistry, to eradicate the problem of content overload which is a result for superficial teaching and assessment. There needs to be negotiations with

higher education institutions on the specific Physics and Chemistry content that should be included in the curriculum for teachers to avoid incompetence due to unrelated qualifications.

- Due to curriculum reforms, effective support for subject advisors through professional development programs is required. The programs should also match current teaching methods using ICT and incorporation of project based learning.
- Education policies should focus on the improvement on quality teaching without compromise, for example the issue of progressed learners is directly linked to quality teaching. Grade 12 teachers cannot produce quality results with learners who failed the previous grade; they are likely to focus on assisting these learners to achieve a minimum pass and not on excellent grades. However, the revision of this policy should not overlook the lack of competence and lack of commitment of some teachers in the internal classes. A program of external assessment could be put in place to ensure that internal grades are taught and assessed at an acceptable level. In the event that learners are struggling with a subject, the progression policy could be implemented provided that it looks into redirecting these learners to other subjects or referring them to vocational education instead of continuing with Physical Science.
- The size of the district should determine the number of subject advisors to be allocated for Physical Science support in a respective district. It is inadvisable for a district with 19 schools to have the same number of subject advisors as a district with 110 schools. The issue of capacity should also consider the amount of support required in a subject. The gravity of improving the quality of Physical Science teaching and increasing the number of people with scarce skills in South Africa necessitates more competent subject advisors in a subject like Physical Science compared with easier subjects.

5.3.2 Recommendation to the Provincial departments and District Directors

Policy documents are likely to take longer to be changed so recommendations for immediate solutions to the district directors are as follows:

- There is a need for collaborative meetings in the whole province to decide on the allocation of human resources and ensure that activities for all district personnel are uniform and are implemented the same way. For example, although subject advisors should ensure that internal examinations for subjects are administered, they should ensure that examinations are set, moderated and submitted to the assessment unit for distribution at schools. The examination unit should deal with external examinations and distribution of question papers should be the responsibility of the exam unit; collection of data from schools should be assigned to data collectors; management of the curriculum, moderation of norm time and school readiness should be the work of cluster leaders; and identification and organization of revision camps should be the work of project managers. The over-allocation of responsibilities of duties to subject advisors compromises quality support for teachers' content and pedagogical content knowledge.
- Curriculum support requires the collaboration of all stakeholders in the management of schools. Effective support at the district offices is possible if cluster leaders, the LTSM unit, project coordinators, assessment unit and exam unit work together with school managers to ensure that resources, activities and proper reporting of Physical Science is done. Different units in the district offices should communicate on deliverables required from schools. It cannot be fair that different officials require the same information from schools; this is very irritating to school management teams.

5.3.3 Recommendation to the subject advisors

Upgrading qqualifications to match the curent CAPS curriculum requirements and the extension of professional development opportunities for Physical Science subject advisors on content and pedagogical content knowledge is required as a matter of urgency. The following immediate measures are recommended:

- Physical Science subject meetings for subject advisors should concentrate predominantly on content and pedagogical content discussions based on the needs of subject advisors. These can be done through 'train the trainer' model where subject advisors conversant with certain topics share content knowledge with others or invite subject specialist from universities. These trainings should take place each term and should be preceded by teacher training on the same content by subject advisors.
- Once subject advisors have received sufficient support, they can do the same for their teachers. This study suggests a framework in figure 5.2 to be used by Physical Science subject for the professional development of teachers.

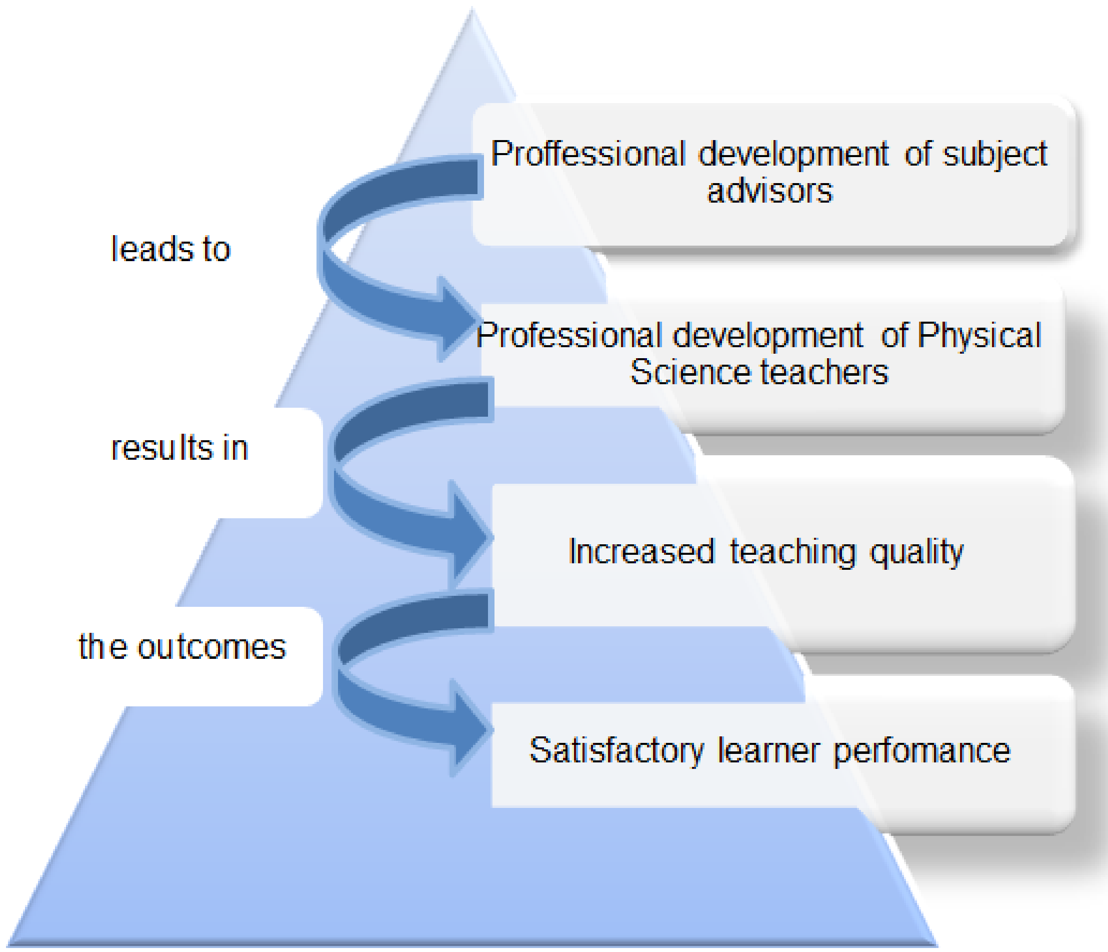

Fig 5.3: The framework on professional development (adapted from Desimone, 2009)

- Management of teachers is a human activity which cannot exclude acceptable personal and professional qualities, interest and positive attitude. Subject advisors should focus on ensuring the cooperation of teachers for effective support. Challenges should be handled professionally without displaying unacceptable emotions to teachers.

5.3.4 Recommendation to school principals

The experience of the researcher on the support by school principals in enhancing the quality of Physical Science teaching is that in schools where the principal was a Physical Science teacher, there are fewer challenges to allocation of human and Physical Science resources for the subject. This is not always the case with other principals. The following recommendations are made:

- Principals should ensure that all resources for teaching Physical Science are available, functional and correctly used by Physical Science teachers. These resources include laboratories, chemicals and equipment for practical lessons, ICT resources for teachers and learners, text books/work books.
- Management of Physical Science teaching and assessment should be monitored following proper policy documents, such as ensuring that curriculum coverage is correctly done, sufficient quality assessment activities are administered, and moderation of school based assessment tasks and follow up is done after school visits by subject advisors.
- No activities should take the time for teaching, for example staff meetings should be done outside of contact time.
- Allocation of teachers per grade should be based on qualifications and competence rather than routine rotation of teachers.

5.3.5 Recommendation to Physical Science teachers

The Physical Science curriculum, teaching methodologies and the kind of Physical Science learners continually change. To keep up with these changes, subject advisors should commit to keep up with the changes. The following recommendations are made:

- Physical Science teachers should familiarize themselves with the CAPS policy document and effect teaching practices and assessment practices stated which can lead to quality teaching. For example, the CAPS policy document states that learners have to be assessed every day, cognitive levels need to be considered when setting assessment activities and the various weightings of the content should determine how much time should be spend on each topic.
- Where teachers have content limitations, they should first seek to resolve this by further study or research, asking for assistance from peers and proper planning.
- Teachers should display positive attitudes to subject advisors and commit to work with them to improve learner performance.

5.4 IMPLICATIONS FOR FURTHER RESEARCH

The researcher feels that the challenges of the performance of Physical Science in Grade 12 is closely related to the quality of the support offered by subject advisors; hence further research can be done on the following topics:

- The restructuring of the Physical Science school curriculum with the aim of increasing content depth-through a choice by learners to either take Physics or Chemistry.
- Strategies to support subject advisors must be based on Physical Science content and pedagogical content knowledge.
- Redefining the roles of Physical Science subject advisors to increase time content and pedagogical content knowledge support.
- Effects of policy implementations on the quality of Physical Science teaching and learner performance.

5.5 CONCLUSION

The subject advisors are curriculum managers whose task is to mediate activities between schools and the provincial department of education. They are required to provide leadership for teachers in terms of curriculum delivery. The main goal of Physical Science subject support is to improve the quality of Physical Science teaching which can translate to improved quality results and in a long run the resolution of scarce skills that are much needed in South Africa. This study was conducted at district offices and schools in the four districts in the same metro. The study focused mainly on curriculum support by subject advisors according to the expectations of their documented roles. The factors that were investigated were qualities of subject advisors, content and pedagogical content knowledge of subject advisors, curriculum delivery management and skills, challenges and possible solutions for effective support.

Data was collected from a provincial DCES, subject advisors, school principals and teachers. In most cases the same data was collected from all participants in order to reinforce the richness of required data for this study and make reliable decisions. The analysis of the data showed similarities and differences in some data collected. These assisted the researcher to identify aspects of the roles of Physical Science subject advisors that should still be researched. Findings from the study showed positive attainment through Physical Science subject advisors for quality teaching practices but also obstacles that hinder support by subject advisors.

Findings achieved most answers that addressed the primary questions. Subject advisors understand their roles; they support Physical Science teachers according to their capacity and capability except where there are challenges beyond them. Teachers and principals mentioned activities that subject advisors perform at schools to support teachers with teaching and assessment practices; an unhealthy relationship identified was an exception. Despite the efforts by subject advisors and the arguments by schools principals and teachers that teaching quality has improved, overall Physical Science district results have not shown much improvement.

Despite activities, interest and compliance with policy documents and initiatives by some subject advisors to increase their content knowledge, professional development have not always resulted in student learning. Learner performance involves many stakeholders in addition to subject advisors and teachers. Subject advisory support is yet to yield improved results in Physical Science through professional development of teachers and student achievement. Teachers need time to transfer what they learn in professional development into practice.

REFERENCE LIST

Adendorff, S.A. and Moodley, T. 2014. Intermediate and Senior Mathematics perceptions of curriculum advisors. *Mediterranean Journal of Social Sciences,5 (15):424-433*

Adler, J. 2005. Mathematics for teaching: What is it and why is it important that we talk about it? *Pythagoras 62*:2-11.Marang Center for Mathematics and Science Education. University of Witwatersrand.

Afolabi, F. O. and Loto, A. B. 2008. Headmasters and Quality Control in primary education through effective intra school supervision in Nigeria. *Journal of Teachers perspective (Jotep), 3*(2), 4-25.

Ainscow, M. 2002. Using research to encourage the development of inclusive practices. In P Farrell and M Ainscow (eds). *Making Special Education Inclusive*. London: David Fulton.

Aksit, F. 2006. Teachers' opinions about performance evaluation (Sample of Bigadiç Primary School Teachers). *Social Sciences Research Journal, 2:* 76-101.

Ali, M. 2011. Head Teachers' Perception and Practices of School Leadership in Primary Schools in Sirajganj District, Bangladesh. Unpublished Master of Arts in Education Dissertation. New Zealand: University of Canterbury, Christchurch.

Alimi, O.S. and Akinfolarin C.A. 2012. Impact of selected modes of instructional supervision activities on students' academic performance in senior secondary schools in Ondo state, Nigeria*. Journal of Educational Research and Reviews,* 2(1): 1-6*.*

Almannie, M.A. 2015. Role of School Superintendent in Saudi Arabia*, International journal of social Science studies,3(3): 169-175*.Redfame publishing. Available on : http://dx.doi.org/10.11114/ijsss.v3i3.780

Altun,T. and Yildiz, A. 2011. Examining characteristics of primary school in terms of school effectiveness and improvement paradigms. *International Journal of Human Sciences,* 8 (2): 455-473.

Amachukwu, R.N. Ololube, N.P. 2015. Excellent School Record Behaviour for Effective Management of Education System. *Human Resource Management Research,* 5(1):12-17.

Anderson, S. E., Mascall, B., Stiegelbauer, S., and Park, J. 2012. No one way: Differentiating school district leadership and support for school improvement. *Journal of Educational Change, 13*(4), 403-430. http://dx.doi.org/10.1007/s10833-012-9189

Ani, C. I. 2007. *Dynamics of school supervision*. Enugu: Cheston Books

Archibong F.I. 2010. Instructional Supervision In The Administration Of Secondary Education: A Panacea For Quality Assurance. *European Scientific Journal,*8 (13)*:61-70.*

Ary, D., Jacobs, L. C., and Razavieh, A. 2002. *Introduction to research in education.* (6th ed.). Belmont, CA: Wadsworth/Thomson Learning.

Asmal, K. and James, W. 2001. Education and democracy in South Africa today. Daedalus: Journal of the American Academy of Arts and Sciences, Winter. 130(1), pp. 185-204.

Aubusson, P., Steele, F., Dinham, S. and Brady, L. 2007. Action learning in teacher learning community formation: Informative or transformative? *An international journal of teacher professional development, 11(2):133-148*.

Balci, A., Aydin, I., Yilmaz, K., Memduhoglu, H. B., and Apaydin, C. 2007. Management and supervision of primary education in Turkish education system: current situation and new perspectives*. The fundamental problems of the primary and preschool education system in Turkey and solutions*. Turkish Education Association Publications: Ankara.

Banerji, R., and Wadhwa, W. 2012. *India infrastructure report*. Retrieved from IDFC Foundation website: http://www.idfc.com/pdf/report/.

Bantwini, B.D. 2010. How teachers perceive the new curriculum reform: Lessons from a school district in the Eastern Cape Province, South Africa. *International Journal of Educational Development,* 30(1): 83-90.

Bantwini, B.D. and Diko, N. 2011. Factors affecting South African district officials' capacity to provide effective teacher support, *Creative education,* 2 (3):103–112.

Bantwini, B.D. and King-McKenzie, E. 2011. District officials' assumptions about teacher learning and change: hindering factors to curriculum reform implementation in South Africa*. International journal of education,* 3 (1): 1–25*.*

Banilower, E. R., Heck, D. J., and Weiss, I. R. 2007. Can professional development make the vision of the standards a reality? The impact of the National Science Foundation's local systemic change through teacher enhancement initiative. *Journal of Research on Science Teaching*, 44: 375–395.

Barber, M., and Mourshed, M. 2007. *How the world's best-performing school systems come out on top.* New York: McKinsey and Company.

Barrett, A. 2005. Teacher Accountability in the Context: Tanzanian Primary School Teachers‟ Perceptions of Local Community and Education Administration. *In Compare,* 35 (1): 43-61*.*

Baxter,J.A. 2013. Professional inspector or inspecting professional? Teachers as inspectors in a new regulatory regime for education in England. *Cambridge Journal of Education,* 43 (4): 467–485.

Bayraktar, S. 2009. Misconceptions of Turkish pre-service teachers about force and motion. *International Journal of Science and Mathematics Education*, 7:273-291.

Bazeley, P. 2004. Issues in Mixing Qualitative and Quantitative Approaches to Research. In *Applying Qualitative Methods to Marketing Management Research*. R. Buber, J. Gadner, eds. Pp 141–156. Hampshire, United Kingdom: Palgrave Macmillan.

Beach, D.M and Reinhartz, J. 2000. *A book on supervisory leadership focusing on instruction*. Boston: Allyn and Bacon.

Bernard, J. M., and Goodyear, R. K. 2004. *Fundamentals of clinical supervision.* (3rd Ed.). New York, NY: Pearson.

Bernstein, A. and Hofmeyr, J. 2015. *CDE Technical Report: Teacher supply and demand 2013-2025*. Johannesburg: Centre for Development and Enterprises. Available on www.cde.org.za.

Bilbao-Osorio, B., Dutta, S. and Lanvin, B. 2014. The global information technology report 2014: Rewards and risks of big data. *World Economic Forum and INSEAD.* Geneva: INSEAD.

Bogdan, R. C., and Knopp Biklen, S. 2006. *Qualitative Research for Education. An Introduction to Theories and Methods.* (5th ed.). Boston: Pearson.

Borg, M., Karlsson B., Hesook, S.K. and McCormack, B. 2012. Opening up for many voices in knowledge construction. Forum: Qualitative Social Research, 13(1):1-16.

Borko, H. 2004. 'Professional development and teacher learning: Mapping the terrain', *Educational researcher*, 33 (8): 3–15.

Borkan, J.M. 2004, *Mixed Methods Studies: A Foundation for Primary Care Department of Family Medicine*, Providence: Brown Medical School/Memorial Hospital of Rhode Island, Pawtucket and Providence.

Borko, H. 2004. Professional Development and TeacherLearning: Mappingthe Terrain.American Educationa; Research Association. *Edicational Researcher,* 33 (8): 3-15.

Bornman, J. and Rose, J. 2010. *Believe that all can achieve: Increasing classroom participation in learners with special support needs.* Pretoria: Van Schaik.

Braine, G. 2006. A history of research on non-native speaker English teachers. In: E Llurda (Ed.): *Perceptions, Challenges and Contributions to the Profession.* New York: Springer, pp. 13-23.

Bryman, A. 2006. Integrating Quantitative and Qualitative Research: How Is It Done? *Qualitative Inquiry,* 6 (1): 97–113.

Burns, J. M. 2003. *Transforming leadership*. London: Atlantic Books.

Bursalioglu, Z. 2003. *Theory and Practice in Educational Administration.* Pegem A Publications: Ankara.

Caldwell, B.J. and Harris, J. 2006. Comparative Governance, Administration and Finance for Elementary and Secondary Education in Selected Countries. *A paper commissioned by the National Center on Education and the Economy for the New commission on the Skills of the American Workforce.*

Campbell, J. Gilmore, L. and Cuskelly, M. 2003. Changing student teachers' attitudes towards disability and inclusion. *Journal of Intellectual and Developmental Disability*, 28(4):369-379. Available at http://eprints.qut.edu.au/4305/1/4305.pdf.

Campbell, C. and Chittleboraugh, G. 2014. The "new" science specialists: Promoting and improving the teaching of Science in primary schools, *European Journal of Teacher Education,*60(1).

Can, N. 2004. Supervision of the primary teachers and their problems, *Journal of National Education*, 161.

Canbay, O. and Beceren, S. 2012. Conceptions of teaching held by the instructors in English language teaching departments. *Turkish Online Journal of Qualitative Inquiry,* 3(3): 71-81.

Chapman, C. 2001. Changing Classrooms through Inspection. In: *School Leadership and Management,* 21(1): 59- 73*.*

Chauke, K.M. 2010. Strengthening Leadership for quality public education. A paper delivered at SADTU branch conference. Mokopane 18 to 19 May 2010.

Charmaz, K. C. 2014. *Constructing grounded theory* (2nd ed.). Thousand Oaks, CA: Sage.

Chemutai, E. 2015. The role of school principals as human resource managers in secondary schools in Nandi County, Kenya. *Global Journal of Human Resource Management vol.3, No.1, pp.73-82, January 2015*. European Centre for Research Training and Development UK.

Chinsamy, B. 2002. *Successful Improvement and the Educational District office in South Africa: Some emerging propositions*.New York: USAID.

Chisholm, L., and Leyendecker, R. 2008. Curriculum reform in post- 1990 Sub-Saharan Africa. *International Journal of Educational Development, 28,* 195-205. doi:10.1016/j.ijedudev.2007.04.003.

Chisholm, L. and Wildeman, R. 2013. The politics of testing in South Africa. *Journal of Curriculum Studies,* 45(1):89-100.

Cobern, W.W., Schuster, D., Adams, B. and Skjold, B. 2013.The Pedagogy of Science Teaching Test. The Mallinson Institute for Science Education, Western Michigan University.

Cohen, L., Manion, L. and Morrison, K. 2000. *Research Methods in Education.* (5th ed.) London: Routledge Falmer.

Cohen, L., Manion, L. and Morrison, K. 2007. *Research Methods in Education.* (6th ed.) London: Routledge Falmer.

Collins, K. M. T., Onwuegbuzie, A. J., and Sutton, I. L. 2006. A model incorporating the rationale and purpose for conducting mixed methods research in special education and beyond. *Learning Disabilities: A Contemporary Journal,* 4, 67–100.

Creswell, J. W. 2003. *Research design: Qualitative, quantitative, and mixed method approaches.* Thousand Oaks, CA: Sage Publications.

Creswell, J. W. 2005. *Educational research: Planning, conducting, and evaluating quantitative and qualitative research.* (2nd ed.). Upper Saddle River, NJ: Pearson Education.

Creswell, J.W., Fetters,M and Ivankova, N.V. 2004 Designing a Mixed Methods Study In Primary Care. *Annals of Family Medicine* 2 (1):7–12.

Creswell, J. W., and Plano Clark, V. L. 2011. *Designing and Conducting Mixed Methods Research.* Thousand Oaks, CA: Sage Publications, Inc.

Creswell, J.W., Klassen, A. C., Plano Clark, V. L., Smith, K. C. and Working Group Assistance. 2011. Best Practices for Mixed Methods Research in the Health Sciences. H. I. Meissner, pp. 27. Washington, DC: Office of Behavioral and Social Sciences Research (OBSSR), National Institutes of Health (NIH).

Daft, R. L., and Lane, P. G. 2005.The Leadership experience(3rd ed.).South-western Cincinnati, OH Available http://www.abebooks.co.uk

Dangara, U. Y. 2015. The Impact of Instructional Supervision on Academic Performance of Secondary School Students in Nasarawa State, Nigeria, *Journal of Education and Practice,* 6 (10).

De Caro, N. E. 2005. *An investigation of the relationship of initiating structure, consideration and gender perception: An examination of the path-goal theory.* (Doctoral dissertation) Retrieved from Pro Quest Dissertations and Theses database. (UMI No. 3187623).

De Clercq, F. 2013. Professionalism in South African education: the challenges of developing teacher professional knowledge, practice, identity and voice. *Journal of Education,* 57.

De Clercq, F and Shalem, Y. 2012. Teacher Knowledge and Professional Development:*Twenty years of transformation in Gauteng 1994-2015*:153-174.Jonathan Ball Publishers(Pty) Ltd.

De Grauwe, A. 2001. *School Supervision in Four African Countries: Vol. 1: Challenges and Reforms*. Paris: UNESCO.

De Grauwe, A. 2012. Transforming School Supervision into a Tool for Quality

Improvement. *International Review of Education,* 53 pp. 709-714.

De Grauwe, A. and Carron, G. 2007. Supervision: A key Component of a Quality Monitoring System, Module 1*, International Institute for Educational Planning*, Paris: UNESCO.

De Marrais, K. 2004. Qualitative interview studies: Learning through experience. In K. deMarrais and S. D. Lapan (Eds.), *Foundations for research* (pp. 51 – 68). Mahwah, NJ : Erlbaum

De Nazaré Castro. M. 2013. Supervision and Evaluation: Teachers' Perspectives. *International Journal of Humanities and Social Science,* 3 (5).

Denzin, N. K. and Lincoln, Y. S. 2000. *Handbook of qualitative research.* Thousand Oaks, CA: Sage Publications.

Department of Education (DoE).2010. *Strategic plan 2010/11-2012/13,* Government Printers, Pretoria.

Department of Basic Education (DoBE). 2011(a). *Curriculum and Assessment Policy Statement (CAPS).* Pretoria: Government Printers.

Department of Basic Education (DoBE). 2011 (b). *Integrated Strategic Planning Framework for Teacher Education and Development in South Africa, 2011– 2025.* Pretoria: Government Printers.

Department of Basic Education (DoBE). 2011 (c). *Policy on organizational roles of district: Better districts, better quality*. Pretoria: Government Printers.

Department of basic Education (DoBE), 2012. Regulations pertaining to the National Curriculum Statement Grades R-12. Notice No. R1114. Regulation Gazette No. 9886 of 28 December 2012

Department of Basic Education (DoBE). 2013. *Policy on organizational roles of district: Effective districts, better quality.* Pretoria: Government Printers.

Department of Basic Education (DoBE). 2017(a). *District Standard Routine and Operation Guidelines of 2017*. Pretoria: Government Printers.

Department of Basic Education (DoBE). 2017(b). Provincial Engagements: Radical Socioeconomic Transformation. National Development plan 2030: A presentation by the Director General H M Mueli.

Department of Basic Education (DoBE).2017 (c).The 2017 National Senior Certificate Results School subject Report.

Department of Higher Education and Training (DoHET). 2011. *The Minimum Requirements for Teacher Education Qualifications*. Pretoria: Government Printers.

Desimone, L. M. 2009. Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. Educational Researcher, 38(3): 181–199.

Desimone, L.M., Hochberg, E.D., Porter, A.C., Polikoff, M.S., Schwartz, R. and Johnson, L.J. 2014. Formal and informal mentoring: Complementary, compensatory, or consistent? *Journal of Teacher Education,* 65(2): 88- 110.

De Vos, A.S., Strydom, H., Fouche, C.B. and Delport C.S.L. 2002. *Research at Grass Roots. (2nd ed).* Pretoria: Van Schaik Publishers.

Dilotsothle, K.E., Smit, J.J.A. and Vreken, N.J. 2001. The perceived roles and functions of school science subject advisors. *South African Journal of Education, 21*, 305-310.

Diko, N., Haupt, G. and Molefe, M.R.M. 2011. Reviewing the role of the provincial and district offices in the implementation of assessment policies in the Gauteng and Western Cape provinces. Pretoria: Human Science Research Council, pp1-56.

Dodonue, D. and Bornman, J. 2014. The challenges of realising inclusive education in South Africa. *South African Journal of Education,*34(2): 1-17.

Donkoh, K.E and Dwamena, E.O. 2014. Effects of Educational Supervision on Professional Development: Perception of public basic school teachers at Winneba, Ghana. *British Journal of Education,*2 (6):63-82.

Driscoll, D. L. Appiah-Yeboah, A. Salib, P.; and Rupert, D.J. 2007. Merging Qualitative and Quantitative Data in Mixed Methods Research: How To and Why Not. *Ecological and Environmental Anthropology,*18.

Dunn, L. 2002. *Theories of learning*. Available http://www.brookes.ac.uk/services/ocsd/

Ehren, M. and Visscher, A. 2006. Towards a Theory on the Impact of School Inspections. In *The British Journal of Educational Studies,* 54(1): 51-72.

Ehren, M and Visscher, A. 2008. The Relationship between School Inspections, Characteristics and School Improvement. In *The British Journal of Educational Studies*, 56 (2): 205-227.

Ekundayo, H. T., Oyerinde, D. O., and Kolawole, A. O. 2013. Effective Supervision of Instruction in Nigerian Secondary Schools: Issues, Challenges and the Way Forward. *Journal of Education and Practice*, 4(8), 185-191.

Elliot, J. 2005. *Using narrative in social research*. London: Sage publications.

Enaigbe, A. P. 2009. Strategies for improving supervisory skills for effective Primary education in Nigeria. *Edo Journal of Counselling,* 2(2), 236-241.

Eslami, Z.R. and Fatahi, A. 2008. Teachers' sense of self-efficacy, English proficiency, and instructional strategies: A study of Non-native EFL teachers in Iran. *TESL-EJH*, 11(4): 1-19.

Evans, L. Thornton, B. and Usinger, J. 2012. *Theoretical Frameworks to Guide school Improvement, 96(2): 154-171. Available on http://doi.org/10.1177/019636512444714.*

Eya, P. E., and Chukwu, L. C. 2012. Effective Supervision of Instruction in Nigerian Secondary Schools: Issues in Quality Assurance. *Journal of Qualitative Education*, 8(1): 1-6.

Fehintola, J.O. 2014. Teachers' Characteristics as Correlates of Students' Academic Performance among Secondary School Students in Saki-west Local Government Area of Oyo State: *Journal of Educational and Social Research,* 4 (6).

Fetter, M.D., Curry, L.A., and Creswell, J.W. 2013. *Achieving Integration in Mixed Methods Designs: Principles and Practices.* Londond:Health Research and Educational Trust.

Fielding, R. E. 2012. *Leadership and effective management.* Glenview: Scott Foresman.

Fishman, B. J., Marx, R. W., Best, S., and Tal, R. T. 2003. Linking teacher and student learning to improve professional development in systemic reform. *Teaching and Teacher Education*, 19, 643–658.

Fleisch, B. 2008. *Primary Education in Crisis: Why South African schoolchildren underachieve in reading and mathematics*. Cape Town: Juta.

Frankel, E.B., Gold, S. and Ajodhia-Andrews, M.A. 2010. International preschool inclusion: Bridging the gap between vision and practice. *Young Exceptional Children*, 13(5):2-16. doi: 10.1177/1096250610379983.

Fraser, C., Kennedy. A. Reid, L. and McKinney, S. 2007. Teachers' continuing professional development: Contested Concepts, Understanding and Models. *Professional Development in Education*, 33(2):153-169. doi: 10.1080/13674580701292913.

Galabawa, J. 2005. Returns to Investments in Education: Startling Relations and Alternatives before Tanzanians*. Professorial Inaugural Lecture Series 45*. University of Dar es Salaam.

Gates, P. and Jorgensen, R. 2009. Foregrounding social justice in mathematics teacher education. *Journal of Mathematics Teacher Education*, 12:161-170.

GDE. 2015. Strategic Plan 2015-2020. Johannesburg.

GDE. 2016. System Wide Curriculum Management Framework (SWCMF). Matthew Goniwe School of Goverance (MGSLG. Pretoria: GDE.

Glatthorn, A.A. 2004. *Supervisory leadership. Introduction to instructional supervision*. New York: McGraw Hill Book Company.

Glickman, C.D., Gordon, S.P., and Ross-Gordon, J.M. 2005. The Basic Guide to Supervision and Instructional Leadership. Needham Heights, MA: Allyn and Bacon.

Grossman, P., Thompson, C. S., and Valencia, S. W. 2002. School districts and Instructional Renewal: Focusing the concerns of new teachers: The district as teacher educator. In A. M. Hightower, M. S. Knapp, J. A, Marsh JA, McLauglin M.W.Teacher College Press, New York.

Guerriero, S. 2016. *OCDE Report. Teachers' Pedagogical Knowledge and the Teaching Profession: Background Report and Project Objectives.* Accessed: 21 July 2016.Accesible on www.oecd.org>edu>ceri.

Halverson, R., Feinstein, N., and Meshoulam, D. 2011. School leadership for science education. In G. E. DeBoer (Ed.) *The role of public policy in K-12 science education.* (pp. 397–430). Charlotte, NC: Information Age.

Hardy, M. and Bryman, A. 2004. *Handbook of data analysis*, London. Sage Publications.

Harris, L.E. 2002. *Supervising the beginning teacher.* Danville II: The Interstate Publishers and Printers.

Harris, A., Day, C., Hopkins, D., Hadfield, M. Hargreaves, A. and Chapman, C. 2003. *Effective Leadership for School Improvement.* London: Routledge Falmer.

Harris, D.N. and Sass, T.R. 2007. Teacher training, Teacher quality and Student achievement: Calder Centre.

Hattie, J., 2012. *Visible Learning for Teachers: Maximizing Impact on Learning*. New York: Routledge.

Hennink, M, Hutter, M. and Bailey, A. 2011. *Qualitative research Methods.* Los Angeles: Sage publications.

Hismanoglu, M. and Hismanoglu, S. 2010. English language teachers' perceptions of educational supervision in relation to their professional development: A case study of northern Cyprus. *Novitas-ROYALS (Research on Youth and Language), 4 (1)*, 16-34.

Hoadley, U. 2012. What do we know about teaching and learning in South African primary schools? *Education as Change,* 16 (2): 187-202.

Hoadley, U., Christie, P and Ward, C. 2009. Managing to learn - Instructional leadership in South African secondary schools. *Research and Development Programme (TEP) Conference* 138-151. Boksburg.

Hoerr, T. R. 2008. What is instructional leadership*? Educational leadership*, 65(4): 84-85.

Holland, P. E. and Adams, P. 2002. Through the horns of a dilemma between instructional supervision and summative evaluation of teaching*. International Journal of leadership in Education,* 5(3): 227-247*.*

Honig, M. I., and Copland, M. A. 2008. *Reinventing district central offices to expand student learning.* Boston; Center for Comprehensive School Reform and Improvement.

Horby, A.S. 2002. Oxford Advanced Learner's Dictionary of Current English Sixth Edition. Cape Town: Oxford University Press

Horizon Research, Inc. 2010. Why Teachers' Science Content Knowledge Matters: A Summary of Studies: Knowledge Management and Dissemination.

House, R.J. 1971. A path-goal theory of leader effectiveness*, Administrative Science Quarterly*, 16(3): 19-31.

House, R. J*.* 1996*.* Path–goal theory of leadership: Lessons, legacy, and a reformulated theory. *Leadership Quarterly,* 7: 323–352.

Howie, S.J. 2003. Language and Other Background Factors Affecting Secondary Pupils' Performance in Mathematics in South Africa. *African Journal of Research in Mathematics, Science and Technology Education*, 7:1-20.

HRDC. 2014. Assessing the Capacity of the District Office to Implement National Policies and Programmes Research Report. Human Resource Development Council for

South Africa. Pretoria. Available on hrdcsa.org.za

Inggris, S.D.B.P. 2012. School effectiveness indicators of the Dutch Inspectorate and its comparison to indicators used in Indonesia in primary education: *Jurnal vidya karya i jilid 27 no. 01.* Universitas Negeri Jambi *[formatted to English SA]*

Isa, Y.K., and Jailaini, B.M.Y. 2014. The supervisors' role for improving the quality of teaching and learning in Nigeria secondary school educational system. *International Journal of Education and Research,* 2(8): 53-60.

Ivankova, N. V., Creswell, J.W. and Stick, S. 2006. Using Mixed-Methods Sequential Explanatory Design: From Theory to Practice. *Field Methods,* 18 (1): 3–20.

Iyengar, R., Jaschke, L., Shin, H., Quintana, E., Mahal. A., Ruto, S., Karuti. S and Jeantillone, N. 2015. *Post 2015: Learning as the Measure of Education in Africa. Center on Globalization and Sustainable Development,* The Earth Institute, Columbia University, New York, USA.

Jahanian, R. and Ebrahimi, M. 2013. Principles for Educational Supervision and Guidance. University- Karaj Branch, Iran. *Journal of Sociological Research,4(2):380-390*

James, A., Naidoo, J. and Benson H. 2008. Casme's approach to the sustainability of Science education in South Africa. University of KwaZulu-Natal.

Jita, L. and Mokhele, M. 2014. When teacher clusters work: selected experiences of South African teachers with the cluster approach to professional. *South African Journal of Education,*34(2)*:*1.

Jonson, K.F. 2008. *Being an effective mentor: How to help beginning teachers succeed.* Thousand Oaks, CA: Corwin Press publishers.

Johnson, C. C., Kahle, J. B., and Fargo, J. D. 2007. A study of the effect of sustained, whole-school professional development on student achievement in science. *Journal of Research in Science Teaching*, 44, 775–786. doi:10.1002/tea.20149

Johnson R.B. and Onwuegbuzie A.J 2004. Mixed Methods Research: A Research Paradigm Whose Time Has Come: Source. *Educational Researcher*, 33 (7): 14-26.

Johnson, R. B., and Turner, L. A. 2003. Data collection strategies in mixed methods research. In A.Tashakkori, and C. Teddlie (Eds.) *Handbook of mixed methods in social and behavioral research.* (pp. 297-319) Thousand Oaks, CA: Sage.

Kahn, M. 2006. Matric matters. In Reddy, V. (Ed.) *Marking matric: proceedings of a colloquium*. Cape Town: HSRC Press.

Kambuga, Y. and Dadi, H. 2015. School inspection in Tanzania as a motor for education quality: challenges and possible way forward. *Review of Knowledge Economy*, 2(1):1-13.

Kamuyu, C. 2001. How not to conduct inspections. *East African Standard: Online Edition*. Available: http://www.eastandard.net/.

Kanjee, A. and Sayed, Y. 2013. Assessment policy in post-apartheid South Africa: Challenges for improving education quality and learning. *Assessment in Education: Principles, Policy and Practice,* 20(4):442-469.

Kankam, G. 2013. Creating synergies and promoting professional development practices in the Faculty of Educational Studies, University of Education, Winneba. A Paper Delivered (26th – 27th May, 2013). Faculty retreat at Manna Height Hotel, Mankessim, Ghana.

Katz, D., and Kahn R. I. 2013. *The social psychology of organizations* (2nd ed.). New York:Wiley.

Kazak, E. 2013. Teachers' opinions about the variance of course supervision practice. *Anatolian Journal of Educational Leadership and Instruction, 1*(1): 15-26.

Khoza, G. 2010. *Sustainable School Improvement: A Partnership between the state, private and civil society.* Johannesburg: JET Education.

Kilminster, S. M., and Jolly, B. C. 2000. Effective supervision in clinical practice settings: a literature review. *Medical Education, 34*(10), 827-840.

Kimbui, C. 2012. Eastern Region assured of governments resolute to education, Kibwezi KNUT boss calls for quality education. *Education News,* 10(9).

Kithuka, M. 2015. Effect of school inspection on KCSE performance, *International Journal of Research in Engineering, IT and Social Sciences,* 5(2).

Koopman, O. 2013. Teachers' Experiences of Implementing the Further Education and Training (FET) Science Curriculum. Dissertation Presented for the Degree of Doctor of Philosophy (Curriculum Studies) University of Stellenbosch.

Kowalski, T. J. And Brunner, C. C. 2005. The school superintendent: Roles, challenges, and issues, *The SAGE handbook of educational leadership: Advances in theory, research, and practice* (pp. 142-167). London, New Delhi: Sage Publications.

Kriek, J. and Grayson, D. 2009. A Holistic development model for South African Physical Science teachers. *South African Journal of Education*, 29 (2).

Kruger, A.G. 2003. Instructional leadership: the impact on the culture of teaching and learning in two effective secondary schools*. Southern African Journal of Education*, 23(3): 206-211.

Kudisch, J. D., Fortunato, V., and Smith, A. 2006. Contextual and Individual Difference Factors Predicting Individuals' Desire to Provide Upward Feedback, *Group and Organizational Management,* 31(4).

Kumar, R. 2005. *Research Methodology*. London: Sage publishers,

KZN Department of Education. 2012. *Curriculum management strategy.* Durban: KZN.

Lasagabaster, D. and Sierra, J.M. 2011, Classroom observation: desirable conditions established by teachers. *European Journal of Teacher Education,* 34(4): 449–463.

.

Leech, N. L., and Onwuegbuzie, A. J. (2007). An array of qualitative analysis tools: A call for data analysis triangulation. *School Psychology Quarterly, 22,* 557–584.

Leech, N. L., and Onwuegbuzie, A. J. 2009. A typology of mixed methods research designs. Quality and Quantity. *International Journal of Methodology*, 43: 265–275.

Leech, N. L., and Onwuegbuzie, A. J. 2010. Guidelines for Conducting and Reporting Mixed Research in the Field of Counseling and Beyond. *Journal of Counseling and Development,* 88.

Leedy, P. D and Ormrod, J.E. 2005. *Practical Research*. New Jersey. Pearson Education.

Letseka, M., Bantwini, B., and King-McKenzie, E. 2012. Public - Union Sector Politics and the Crises of Education in South Africa, *Creative Education*, 3(7):1197-1204.

Lew, H.C., Cho, W.Y., Koh, Y., Koh, H.K.and Paek, J. 2012. New challenges in the 2011 revised middle school curriculum of South Korea: Mathematical process and Mathematical attitude. *ZDM,* 44(2): 109-119.

Li, Y.L. 2009. The perspectives and experiences of Hong Kong preschool teacher mentors: Implications for mentoring. *Teacher Development,* 13: 147–58.

Lomofsky, L. and Lazarus, S. 2001. South Africa: First steps in the development of an inclusive education system. *Cambridge Journal of Education*, 31(3):303-317. doi: 10.1080/03057640120086585.

London, N.A. 2004. School inspection, the inspectorate and educational practice in Trinidad and Tobago. *Journal of Educational Administration, 42:* 479-502.

Lopez-Fernandez, O. and Molina-Arozin, JF. 2011. The use of mixed methods research in the field of behavioural sciences. Obtainable from http:epub.scu.edu.au Accessed in October 2017.

,

Louw, B. and Wium, A. 2015. The South African national school curriculum: Implications for collaboration between teachers and speech-language therapists working in schools. *South African journal of childhood education, 5(1):1-28.*

Lowenthal, P. R., and Leech, N. 2009. Mixed research and online learning: Strategies for improvement. To appear in T. T. Kidd (Ed.), *Online education and adult learning: New frontiers for teaching practices*. Hershey, PA: IGI Global.

Lugaz, C. and De Grauwe, A. 2010. *Schooling and decentralisation Patterns and Policy Implications in Francophone West Africa.* Paris: International Institute for Educational Planning,1-152.

Luft, J. A., and Hewson, P. W. (2014). Research on teacher professional development programs in science. In S. K. Abell and N. G. Lederman (Eds.) *Handbook of research on science education.* (Vol. II). New York, NY: Routledge.

Mabogoane, T. 2006. Recognising behaviour that increases learning: The possible role of incentives in the teaching profession. *Perspectives in Education*, 24(2):127-139.

Madziyire, N. C. 2010. *Supervision of educational personnel.* Harare: Zimbabwe Open University.

Mafora, P. and Phorabatho, T. 2013. Curriculum Change Implementation: Do Secondary School Principals Manage the Process? *Anthropologist*, 15(2): 117-124.

Maher, M. 2009. Information and advocacy: Forgotten components in the strategies for achieving inclusive education in South Africa? *Africa Education Review*, 6(1):19-36. doi: 10.1080/18146620902857251.

Mansell, W., James, M., and The Assessment Reform Group. 2009. *Assessment in schools. Fit for purpose? A Commentary by the Teaching and Learning Research Programme.* London, UK: Economic and Social Research Council, Teaching and

Learning Research Programme.

Maree, K. 2007. *First steps in Research*. Pretoria: Van Schaik Publishers.

Marsh, J. A. 2002. How districts relate to states, schools, and com-munities: A review of emerging literature. In A. M. Hightower, M. S. Knapp, J. A. Marsh, and M. W. McLaughlin (Eds.), *School districts and instructional renewal* (pp. 25-40). New York: Teacher College, Columbia University.

Massell, D. 2000. The district role in building capacity: Four strategies. Philadelphia: Consortium for Policy Research in Education, Graduate School of Education. University of Pennsylvania*.*

Matete, R.E. 2009. The impact of primary school inspection on teaching and learning in Tanzania: A study of Mbeya city district. Unpublished Master of Philosophy in Comparative and International Education, *Institute for Educational Research,* Faculty of Education, University of Oslo.

Maxwell, J. A. 2005. *Qualitative research design: An interactive approach* (2nd ed.)*.* Thousand Oaks, CA: Sage.

MacBeath, J. 2006. *School Inspection & Self-Evaluation: Working with the New Relationship*. London: Routledge.

Marzano, R. J., Waters, T., and McNulty, B. A. 2005. *School leadership that works: From research to results.* Denver, CO: Mid-continent Research for Education and Learning.

Mavuso, M.P. 2013. Education District Office Support for Teaching and Learning in Schools: The case of two districts in the Eastern Cape. University of Fort Hare.

Mavuso, M.P and Moyo, G. 2014. Education District Office Coordination of Teaching and Learning Support .Programmes in South Africa: Eastern Cape Perspective, *Mediterranean Journal of Social Sciences,5(23):1083-1089.*

McKinsey and Company. 2007. *How the World's Best-performing School Systems came out on Top.* Available*:* http://www.mckinsey.com/App_Media/Reports (18 April, 2011).

McMillan, J. H., and Schumacher, S. 2001. *Research in education: A conceptual introduction.* (5th ed.) New York: Longman.

McMillan, J.H. and Schumacher, S. 2010. *Research in Education.* New Jersey. Pearson Education Inc.

Meltzera, E.D. 2013.*Teacher Education in Physics: Curriculum and practice, Physics Teacher Education coalition.* Washington: University of Washington

Memduhoğlua, H.B. 2012. The Issue of Education supervision in Turkey in the Views of Teachers, Administrators, Supervisors and Lecturers. *Educational Sciences: Theory & Practice,* 12(1).

Memduhoğlu, H. B., and Taymur, A. 2014. A Model Proposal Regarding to Reconstruction of Subsystem of Education Supervision in Turkey. *Pegem Journal of Education & Instruction,* 4(2).

Merriam, S. 2009. *Qualitative research: A guide to design and implementation (Revised and expanded from 'Qualitative research and case study applications in education')*. Hoboken, NJ: Jossey-Bass (Wiley).

Milondzo, K.S. and Malatji, M.A. 2015. Exploring the impact of Strategic Management on Learner performance in Capricorn Education District, Limpopo Province. Centre for Academic Excellence: University of Limpopo, South Africa. *Journal of Education Research and Behavioral Sciences,* 4(5): 172-180.

Mkhwanazi, S . 2013. Teacher Professional Learning: An Analysis of Teachers' Views on Their Professional Content Knowledge, Department of Educational Leadership and Management. University of South Africa. *Journal of Social Science,* 37(2): 179-187.

Mlilo, D. 2010. *Supervision of primary school teachers in Hwange District of Zimbabwe.* Harare: Zimbabwe Open University.

Mobegi, O., Ondigi, B., and Oburu, O. 2010. Secondary school head teachers' quality assurance strategies and challenges in Gucha district, Kenya. *Education Research and Reviews,* 5(7):408-414.

Mohlala, T. 2007. Making districts a key support, *Mail and Guardian online*. The Smart News Source, Johannesburg, 1-3.

Mokiwa, H.O. and Msila, V. 2013. Teachers' Conceptions of Teaching Physical Science in the Medium of English: A Case Study. *International Journal of Science Education,* 5(1): 55-62.

Moloi, M.Q and Chetty, M. 2010. *The SACMEQ III Project in South Africa. A study of the conditions of schooling and the quality of education.* SACMEQ (Southern and Eastern Africa Consortium for Monitoring Educational Quality) Educational Policy Research Series. Pretoria: Department of Basic Education.

Montgomery, D. 2002. *Helping teachers develop through classroom observation*. 2nd ed. London: David Fulton.

Moodley, G. 2013. Implementation of the Curriculum and Assessment Policy Statements: Challenges and Implications for Teaching and Learning. Med Thesis, Unpublished. Pretoria: University of South Africa.

Moswela B. 2010. Instructional Supervision, a tool for improvement or weapon: Instructional supervision in Botswana Secondary Schools. An investigation.*EducationalManagement, Administration and Leadership,*38(1).

Motaung, Z. 2011. *Effective and ineffective managers in an organisation.* A paper presented to circuit managers strategic planning session. Makgobaskloof.

Motshekga, A. 2011. *Statement on the release of the Annual National Assessment results for 2011.* Retrieved from http://www.education.gov.za/Newsroom/Speeches/tabid/298/Default.aspx

Motshekga, A. 2013. Statement on the Release of the Annual National Assessments Results for 2013. *Newsroom Speeches,* 5 December 2013. Pretoria: Department of Basic Education.

Moyo, T. 2014. *Supervision for effective teaching and learning.* Harare: College Press.

Muijs D 2008. Widening opportunities? A case study of school-to-school collaboration in a rural district. *Improving Schools*, 11(1):61-73. doi: 10.1177/1365480207086755.

Munemo, E., and Tom, T. 2013. The Effectiveness of Supervision of Specialist Teachers in Special Schools and Resource Units in Mashonaland East and Harare Provinces(Zimbabwe), *Greener Journal of Educational Research, 3*(3).

Murphy, J., and Hallinger, P. 2001. Characteristics of instructionally effective school districts. *Journal of Educational Research,* 81, 175-181.

Mwinyipembe, M.M. and Orodho, J.A. 2014, Effectiveness of Quality Assurance and Standards Officers' School Supervisory Roles in Enhancing Students' Academic Performance in National Examinations in Nakuru District Kenya. *Journal of Education and Practice, 5(16): 69-80.*

Naicker, S.R. and Mestry, R. 2015. Developing educational leaders: A partnership between two universities to bring about system-wide change. *South African Journal of Education, 3*5 (2)*:1-11*

Naidoo, D. and Green, W. 2010. Differentiated pedagogy in diverse Physical Science classrooms. *Journal of Education*, 48: 7-36

Naidoo, J. 2012. Teacher Reflection: The Use of Visual tools in Mathematics classrooms. Journal of the Association for mathematics Education. *Pythagoras, 33(1): p 1-9.*

Naidoo, J. and Paideya, V. 2015, Exploring the possibility of introducing Supplemental Instruction at secondary school level, *South African Journal of Education,* 35 (2).

Nakpodia, E.D. 2006. *Educational Administration: A New Approach.* (2nd Edn), Warri: Jonokase Publishers.

Nasser, I., Kidd, J.K., Burns, M.S. and Campbell, T. 2013. Head Start Classroom Teachers' and Assistant Teachers' Perceptions of Professional Development Using a LEARN framework. *Professional Development in Education*. From

<http://www.tandfonline.com/doi/ pdf/10.1080/19415257.2013.833538> (Retrieved on 17 September 2014).

National Open University of Nigeria (NOUN). 2006. *Supervision of instruction in Education.* Lagos: Press craft, production Company.

Ncube, A.C., Tshabalala,T., Muranda, A.Z.and Mapolisa, T. 2015. An assessment of the effectiveness of supervision of teachers in Binga district schools. *International Journal of Innovation and Applied Studies,*11(2):387-394.

Ndlovu, M.C. 2011. University-school partnerships for social justice in Mathematics and Science education: the case of the SMILES project at IMSTUS. *South African journal of education,* 31(3):419-433.

Ndou, F.N. 2008. *The Role of School Management Teams in Curriculum Change Management.* M.Ed. Dissertation, Unpublished. Pretoria: University of South Africa.

Negron, D. 2008. A case study examining the relationship of the path-goal theory leadership styles to profits in El Paso, Texas, Rent-A-Center stores. (Doctoral dissertation). Capella University. Retrieved from Pro Quest Dissertations and Theses database. (UMI No. 3331408)

NEEDU. 2013. *The state of our education system National report 2012: The State of Literacy Teaching and Learning in the Foundation Phase.* Pretoria: DoBE.

Niknami, M. 2011. *Educational Guidance and Supervision.* Cape Town: SAMT Publication.

Nkechi, O., Umemetu, M. and Ogbonnaya, N.O. (2013). Supervision and inspection for effective primary education in Nigeria: Strategies for improvement. *Academic Research International,* 4(4): 586-594.

Nkinyangi, S. 2006. *Quality Standards and Quality Assurance in Basic Education: Experience from Burundi, Eritrea, Kenya, Rwanda and Uganda.* Nairobi: UNESCO.

Northhouse, P.G. 2010. *Leadership Theory and Practice*. (5th ed). Thousand Oaks: Sage Publications.

Northouse, P.G. 2013. *Leadership Theory and Practice*. Thousand Oaks: Sage Publications.

Nwangwa, K.C.K. and Omotere, T. 2013. The new roles of school managers in managing educational changes in Nigerian schools. *European Scientific Journal,* 9 (25).

Nzoka, T.K. and Orodho, J A. 2014. School Management and Students' Academic Performance: How Effective are Strategies being Employed by School Managers in Secondary Schools in Embu North District, Embu County, Kenya? Kenyatta University Kenya. *International Journal of Humanities and Social Science,* 4 (9): 86-99.

Obadara, N.O. 2005. A prospective longitudinal study of psychological predictors of achievement. *Journal of School Psychology*, 34(3): 285 - 306.

Obanya, R. A. (2005). *Evaluation of school performance in West Africa*. Benin City: Ambik Press.

Obiweluozor, N., Momoh, U., and Ogbonnaya, N. O. 2013. Supervision and Inspection for Effective Primary Education in Nigeria. Strategies for Improvement. *Academic Research International, 4*(4), 586-594.

O'Caithan, A., Murphy, E and Nicholl, J. 2007. Integration and Publications as indicator of "yield" from mixed methods studies: Available at http:///sagepublications.com.[Accessed 11/11/2011]

O'Cathain, A., Murphy. E., and Nicholl, J. 2010. Three Techniques for IntegratingData in Mixed Methods Studies. *British Medical Journa*l, 341: c4587.

Ogunu, M. A. 2005. *Introduction to Educational Management.* Benin City: Mabagun.

Ojelabi, A.1981. *A guide to school management.* Ibadan: Valuta Educational Publishers

Okendu, J.N. 2012 (a). The impact of school administrative structure and adequate supervision on the improvement of Instructional process. *Academic Research Journal,* 2(3).

Okendu, J.N. 2012 (b). The influence of instructional process and supervision on academic performance of secondary school students of Rivers State, Nigeria. *Academic Research international journal,* 3(1): 147-151.

Okumbe, J.A. 2007. *Educational Management: Theory and Practice*: Nairobi University Press.

Okoro, N.J. 2004. The role of Sex in Education Achievement. *Journal of teacher's perspective, 4*(7): 12-14.

Olaleye, F.O. 2013. Principals Organizational Management and Students Academic Achievement in Secondary Schools in Ekiti State Nigeria: *Singaporean Journal of Business Economics, And Management Studies,* 2(2): 76-84.

Olivier, W.A. 2013. Reflection on the training of teachers for the CAPS Mathematics curriculum :Report on CAPS training of Maths Teachers . Advisory Committee on Mathematics. SAM.F

Ololube, N. P. 2013. *Educational Management, Planning and Supervision: Model for Effective Implementation.* Owerri: Spring Field Publishers.

Ololube, N.P. 2014. School Inspection and Educational Supervision: Impact on Teachers' Productivity and Teacher Education Programs in Nigeria. *International Journal of Scientific Research in Education,* 7(1): 91-104.

Ololube, P.O and Major, N.B. 2014. School inspection and Educational Supervision: Impact on Teachers' Productivity and Effective Teacher Education Programs in Nigeria. *International Journal of Scientific Research in Education*, 7(1): 91-104.

Omemu, F. 2015. Leadership and administrative skills for optimal universal basic education delivery in Nigeria. *African Research Review, An International Multidisciplinary Journal, Ethiopia,*9(3): 50-61.

Onasanya, S.A. 2011. The concept of practice of supervision/inspection in Kware state public primary school. Unpublished thesis. University of Ilorin. Nigeria.

Onwuegbuzie, A. J. 2003. Expanding the framework of internal and external validity in quantitative research. *Research in the Schools,* 10: 71–90.

Onwuegbuzie, A. J., and Collins, K. M. T. 2007. A typology of mixed methods sampling designs in social science research. *The Qualitative Report*, 12: 281–316.

Onwuegbuzie, A. J., and Teddlie, C. 2002. A Framework for Analysing Data in Mixed Methods Research. In *Handbook of Mixed Methods in Social and Behavioral Research.* A. Tashakkori and C. Teddlie, eds. Pp. 351-383. Thousand Oaks, CA: Sage.

Orenaiya, S.A., Adenovo, E.A., Aroyeun, F.T., and Odusoga, R. 2014. School inspection or, and suspension effects in public secondary schools in Ogun State, Nigeria: Where are we and where do we go? *International Journal of Humanities and Social Science*

Invention, 3(6), 74-80.

Oswald, M. and Swart, E. 2011. Addressing South African pre-service teachers' sentiments, attitudes and concerns regarding inclusive education. *International Journal of Disability, Development and Education*, 58(4):389-403.

Oyaya, E.O. 2007. Directorate of Quality Assurance and Standards: The Rationale, the Headquarters Organogram and the Schedule of Duties for Quality Assurance and Standards Officers at the Headquarters, Nairobi.

Oyewole, B.K. and Ehinola, G.B. 2014. Relevance of instructional supervision in the achievement of effective learning in Nigerian secondary schools**.** *Global Journal of Commerce &Management Perspective ,3(3): 88-92.*

Ozdemir, T. Y. and Yirci, R. 2015. A Situational Analysis of Educational Supervision in the Turkish Educational System. *Educational Process: International Journal,* 4 (1-2): 56-70.

Parker, D. 2011. Enhancing Teacher Professionalism and Status: Commonwealth Presentation. United Kingdom. Commonwealth Secretariat.

Patton, M.Q. 2002. *Qualitative Research and Evaluation Methods*, Third Edition. New Delhi: Sage publications.

Patton, M. Q. 2015. *Qualitative research & evaluation methods: Integrating theory and practice.* (4th ed.). Thousand Oaks, CA: Sage.

Patton, M. Q and Cochran, M. 2002. *A guide to using qualitative research methodology*. Medecins Sans Frontier.
Available at http://www.scribd.com/document/64041355/Qualitative -Methodology.

Pianta, R. C. 2011. Teaching children well: New evidence based approaches to teacher professional development and training. *Center for American Progress*, 11, 1–36.

Phoshoko, M. 2015. Experiences of Role Players in the Implementation of Mathematics Teachers' Continuous Professional Development in South Africa. *Internationl journal of Science education,*,8(1):241-248

Pop, M.M., Dixon, P. and Grove, C. 2010. Research experiences for teachers (RET): Motivation, expectations, and changes to teaching practices due to professional program involvement. *Journal of Science Teacher Education,* 21:127-147.

Punch, K. F. 2006. *Developing Effective Research proposals*: London: Sage publications.

Rad, A.M.M. and Yarmohammadian, M.H. 2006. A study of relationship between managers' leadership style and employees' job satisfaction. *Leadership in Health Services*, 19 (2): 11-28.

Ramnarain, U. and Fortus, D. 2013. South African Physical Sciences teachers' perceptions of new content in a revised curriculum. *South African Journal of Education,* 33(1): 1-15.

Ratyan, A.T and Mohd, R. A. 2013**.** Overview of path-goal leadership theory. *Comprehensive Research of Education and General Studies, 1(1):001-005.*

Republic of Kenya. 2005. *Kenya Education Sector Support Programme 2005 - 2010: Delivering Quality Education and Training to All Kenyans.* Nairobi: Ministry of Education.

Republic of Kenya. 2012a. *Sessional Paper No.14 of 2012 on realigning education and training to the Constitution of Kenya 2010 and Vision 2030 and beyond.* Nairobi: Ministry of Education Science and Technology.

Republic of Kenya**.** 2012b. *A Policy Framework for re-aligning education to the Constitution 2010 and Vision 2030 and beyond.* Nairobi; Ministry of Education.

Republic of Kenya. 2013. *The Basic Education Act 2013 No.14 0f 2013.* Nairobi: Ministry of Education.

Ribbins, P. 2007. Interviews in educational research: conversations with a purpose. In A.R.J. Briggs and M. Coleman Eds.), *Research methods in educational leadership and management*. (2nd ed.). London: SAGE.

Robin, M. 2009. Path Goal Theory of Leadership. In *Encyclopedia of Group Processes & Intergroup Relations.* Thousand Oaks, CA: SAGE.

Robin, M. 2012. Path Goal Theory of Leadership. *Encyclopedia of Group Processes & Intergroup Relations.* Edited by Levine, J.M and Hogg, M.A. Thousand Oaks, CA: SAGE, pp. 636-37.

Roberts, J. 2001. *Mapping school reform initiatives in South Africa: An overview of 12 school reform projects.* Johannesburg: Joint Education Trust publication.

Roberts, J. 2012. *District Development: The hope for Educational Reform.* Johannesburg: JET Education Services.

Roehrig, G.H. and Kruse, R.A. 2005. The role of teachers' beliefs and knowledge in the adoption of a reform-based curriculum. *School Science and Mathematics,* 105:412-422.

Rogers, C.R. 1967. T*he Interpersonal Relationship in the Facilitation of Learning in Humanizing Education: The Person in the Process.* Ed. T. Leeper. New York: National Education Association, Association for Supervision and Curriculum Development, p1-18.

Rogers, C.R. 1969. *Freedom to learn. A view of what education might become*. Columbus, Ohio: Charles E. Merrill.

Rorrer, A. K., Skrla, L., and Scheurich, J. J. 2008. Districts as institutional actors in educational reform. *Educational Administration Quarterly,* 44, 307-358.

Rossman, B. and Rallis S.F. 2003. *Learning in the Field.* London: SAGE.

.

Samuel, C. C. 2006. *Supervision.* New York: McGraw-Hill Company.

Scheerens, J. 2005. The School Effectiveness Knowledge Base as a Guide for School Improvement. In *The Practice and Theory of School Improvement*. Dordrecht: Springer.

Schoeman, H. 2004. *Inclusive Education, South Africa: moving from a centralized and segregated education System to a decentralized and inclusive education approach,* Pretoria: South African Council for the Blind.

Selesho, J.M. and Monyane, T. 2012. Analysing views of Intermediate Phase educators with regard to their experiences of the Revised National Curriculum Statement. *Anthropologist*, 14(2): 107-111.

Sergiovanni, T. J., and Starratt, R. J. 2002. *Supervision: A redefinition* (7th ed.). Mc Graw Hill: New York.

Silverthorne, C .2001. A test of the path-goal leadership theory in Taiwan. *Leadership & Organization Dev. J.*, 22(4): 151-158.

Singh, J.K. and Pandey, D.K. 2013. Role of ICT in professional development of prospective teachers: Possibilities and challenges. *International Journal for Research in Education,* 2(9): 35-45.

Siyepu, S. 2013. The zone of proximal development in the learning of Mathematics. *South African Journal of Education,* 33(2): Art. #714, 13 pages, http://www.sajournalofeducation.co.za.

Smith, C. 2011. Self-perception of a South African urban school district. *Journal of Education, 52: 111-132*

Smythe, W.E and Murray, M.J. 2000. Owning the story: Ethical considerations in narrative research. http://doi.org/10.1207/S15327019EB1004_1

Sneiderman, B and Plaisant, C. 2005. *Boston Ministry of Education Science and Technology*. Boston: Pearson.

Spaull, N. 2013. South Africa's Education Crisis: The quality of education in South Africa 1994-2011.*Centre for Development and Enterprise*, 1-65

Spillane, J. P. 2002. Local theories of teacher change: The pedagogy of district policies and programs. *Teachers College Record,* 104: 377–420.

Spillane, J. P., Camburn, E. M., and Stitziel, P. A. 2007. Taking a distributed perspective to the school principal's workday. *Ministry of Education Science and Technology,* 6: 103–125.

Spillane, J. P., Halverson, R., and Diamond, J. B. (2001). Investigating school leadership: A distributed practice. *Educational Researcher*, 30(3), 23–28.

Stadan, V. E. 2000. *Human resource management (2nd ed).* Pretoria: SACTE.

Stein, M. K., and D'Amico, L. 2002. The district as a professional learning laboratory. In A. M. Hightower, M. S. Knapp, J. A. Marsh, & M. W. McLaughlin (Eds.). *School districts and instructional renewal* (pp. 61-75). New York: Teacher College, Columbia University.

Stofile, S.Y. 2008. Factors affecting the implementation of inclusive education policy: A case study in one province in South Africa. PhD thesis. Cape Town: University of the Western Cape. Available at http://etd.uwc.ac.za/usrfiles/modules/.

Stoll, L. Bolam, R. McMahon, A. Wallace, M. and Thomas, S. 2006. Professional learning communities: A review of the literature. *Journal of Educational Change*, 7(4):221-258.

Subedi, D. 2016. Explanatory Sequential Mixed Method Design as the Third Research Community of Knowledge Claim. Kathmandu University School of Education, Nepal.

Sule, M. 2013. The influence of the principals' supervisory demonstration strategy on teacher's job performance in Nigeria secondary schools. *IQSR journal of Humanities and Social Science,*. 2(1): 39 - 44.

Tesfaw, T. A. and Hofman, R. H. 2012. Instructional supervision and its relationship with professional development: Perception of private and government secondary school teachers in Addis Ababa. [Online] Retrieved from *http://www.eric.ed.gov/PDFS/ED534226.pdf*.

Tesema, A. 2014. The practice and challenges of school-based supervision in government secondary schools of Kamashi zone of Benishangul Gumus regional state. Jimma University.

The South African Concise Oxford Dictionary. 2008. Oxford University Press. 9th impression.

Thomas, J.R., Nelson, J.K and Silverman, S.J. 2014. *Research methods in Physical activity.* (sixth edition) .Accessible from www.Human kinetics.com.

Towndrow, P.A., Tan, A., Yung, B.H.W. and Cohen. L. 2010. Science teachers' professional development and changes in science practical assessment practices: What are the issues? *Research in Science Education*, 40:117-132.

Treslan, D.L. 2005. *Educational Supervision in a "Transformed" School Organization,* Faculty of Education, Memorial University of New foundlands. United State Department of Education. *The free encyclopaedia,* 1-6.

Umunadi, K. E., and Ololube, N. P. 2014. Blended Learning and Technological Development in Teaching and Learning. In N. P. Ololube (Ed). *Advancing Technology and Educational Development through Blended Learning in Emerging Economies*, (pp. 213-231). Hershey, PA: Information Science Reference. DOI: 10.4018/978-1-4666-4574-5.ch012.

UNESCO. 2000. Human Resource Development in Support of Inclusive Education. Sub-Regional Workshop, Central and Eastern Europe, Report. On the Internet: http://www.unesco.org/education/educprog/sne/publications/bucharest/cover.html.

UNESCO. 2004. *Education for All: The Quality Imperative*. Paris: UNESCO http://unesdoc.unesco.org/

UNESCO. 2007. Reforming school supervision for quality improvement. Retrieved from www.iiep.unesco.org/filedmin/.../Supervision/SUP_Mod8.

UNESCO. 2012. *Systematic monitoring of education for All*. Paris: United Nations Educational, Scientific and Cultural Organization. UNESCO.

Van der Berg, S. and Louw, M. 2008. South African student performance in regional context. In G Bloch, L Chisholm, B Fleisch and M Mabizela (eds). *Investment choices for South African education.* Johannesburg: Wits Education Press.

Van der Berg, S., Taylor, S., Gustafsson, M. Spaull, N. and Armstrong, P. 2011. *Report for the National Planning Commission Improving Education Quality in South Africa: Report for the national Planning Commission.* Department of Economics, University of

Stellenbosch.

Van Manen, M. 2014. *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing.* Walnut Creek, CA: Left Coast Press.

Vermunt, J.D. 2014. Patterns in student learning: the past, present and a future. Paper presented at the European Association for Learning and Instruction, SIG 4 Conference, Leuven.

Vieluf, S., Kaplan, D., Klieme, E. and Bayer, S., 2012. Teaching Practices and Pedagogical Innovation: Evidence from TALIS. OECD Publishing, [online] Available from: http://dx.doi.org/10.1787/9789264123540-en

Villegas-Reimers. E 2003. Teacher Professional Development: An International Review of the Literature: IIEP. Paris.

Vorderman, C. Porkess, R. Budd, C. Dunne, R. and Rahman- Hart P 2011. *A world-class Mathematics Education for all our young people.* London: The Conservative Party.

Wanzare, Z.O. 2002. Rethinking school inspection in the third world: The case of Kenya. *Educational Management, Administration & Leadership,* 30(2): 213-229.

Wasanga, P.M. 2004. Kenya Quality Assurance in basic education 6-8 Dec 2004 *Kenya*

Position Paper. Prepared for UNESCO Nairobi Cluster Consultation.

Waweru, P.N and Orodho, A.J. 2013 .Management practices and students' academic performance in national examinations in public secondary schools in Kiambu County. *International Journal of Scientific Research,* 5(2):472-479.

White, L. 2013. Curriculum Support Groups as Ecologies of practice for Teacher Development, Doctoral Thesis submitted for the University of Pretoria.

Wilcox, B. 2000. *Making School Inspection Visits More Effective: The English Experience.* Paris: UNESCO.

Whitworth, B.A. and Chiu,J.L. 2015. Professional Development and Teacher Change: The Missing Leadership Link. *https://www.researchgate.net/publication/271014552*

Wilkinson, E.M. 2010. Factors contributing to the disparities of academic performance in public and private basic schools in the New Juaben municipality. [Online] Retrieved from *http://www.ir.ucc.edu.gh/dspace/bitstream/123456789/*

Win, D.D. 2010. *Accountability and Control.*
Retrieved from http:www.jeywin.com/wp.content/ Uploads.

Winch, C. 2010. *Dimensions of Expertise: A Conceptual Exploration of Vocational Knowledge.* London: Continuum.

World Bank. 2010. *Supervision of Primary and Secondary Education: A Five-Country Comparison,* Volume 33. Paris: World Bank.

Yin, R.K. 2003. *Case study research: designs and methods.* 3rd ed. Thousand Oaks, CA: Sage.

Yin, R. K. 2009. *Case study research: Design and methods.* 4th ed. Thousand Oaks, CA: Sage.

Yin, R. K. 2011. *Qualitative research from start to finish.* New York, NY: Guilford Press.

Yoon, K. S., Duncan, T., Lee, S. W.Y., Scarloss, B., and Shapley, K. 2007. Reviewing the evidence on how teacher professional development affects student achievement (Issues and Answers Report, REL 2007-No. 033). Washington, DC: US Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Southwest.

Zuljan, M.V. 2007. Students' conceptions of knowledge, the role of the teacher and learner as important factors in a didactic school reform. *Educational Studies,* 33(1).

Tatweer. 2012. King Abdullah Project planning guide. Riyadh.U.S.-Saudi Arabian Business Council. *The education sector in the Kingdom of Saudi Arabia.*http://www.us-sabc.org/files/public/Education_Brochure.pdf.

ANNEXURES

ANNEXURE A: APPLICATION TO CONDUCT STUDY IN GAUTENG EDUCATION INTITUTIONS

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

For admin. use only:

Ref. no.:

Enquiries: 011 843 6503

2016 GDE RESEARCH REQUEST FORM

REQUEST TO CONDUCT RESEARCH IN INSTITUTIONS AND/OR OFFICES OF THE GAUTENG DEPARTMENT OF EDUCATION

1. PARTICULARS OF THE RESEARCHER

1.1	**Details of the Researcher**
a) Surname and Initials:	STEPHEN MM
b) First Name/s:	MAGDELINE MMAPASEKA
c) Title (Prof/Dr/Mr/Mrs/Ms):	MRS
d) Student Number:	31637914
e) SA ID Number:	7204060530087
f) Work permit no. (If not SA citizen)	N/A

1.2	Private Contact Details
a. Home Address	***c. N/A***
101 CHOSEN HOUSE FLATS	
214 RISSIK STREET	
SUNNYSIDE	
b. Postal Code: 0002	***d. Postal Code:*** N/A
e. Tel: 072 691 5562	***f. Cell: 072 691 5562***
g. Fax: N/A	***h. E-mail: sekamokhu345@gmail.com***

2. PURPOSE & DETAILS OF THE PROPOSED RESEARCH

2.1 Purpose of the Research (Place a cross where appropriate)	
Undergraduate Study - Self	
Postgraduate Study - Self	X
Private Company/Agency – Commissioned by Provincial Government or Department	
Private Research by Independent Researcher	
Non-Governmental Organisation	
National Department of Education	

Commissions and Committees	
Independent Research Agencies	
Statutory Research Agencies	
Higher Education Institutions only	

2.2	**Full title of Thesis / Dissertation / Research Project**
THE PEDAGOGY OF PHYSICAL SCIENCE SUBJECT ADVISORS - ITS ROLE IN ENHANCING THE QUALITY OF PHYSICAL SCIENCE	
2.3	**Value of the Research to Education (Attach Research Proposal)**
Improve on defining te roles of subject advisors in improving the quality of results at schools	

2.4	**Date**
a. <u>Estimated</u> date of **completion of research in GDE Institutions**	**2018**
b. <u>Estimated</u> date of **submission of Research Report /Thesis/Dissertation and Research Summary to GDE:**	**2019**

2.5	**Student and Postgraduate Enrolment Particulars**
a. Name of institution where enrolled:	UNISA
b. Degree / Qualification:	PhD in Education

c. Faculty and Discipline / Area of Study:	PhD in Education-Curriculum studies
d. Name of Supervisor / Promoter:	Prof. Abraham AT Motlhabane

2.6	**Employer (or state Unemployed / or a Full Time Student) :**
a. Name of Organisation:	GAUTENG DEPARTMENT OF EDUCATION
b. Position in Organisation:	SENIOR EDUCATION SPECIALIST(SUBJECT ADVISOR)
c. Head of Organisation:	DEPARTMENT OF BASIC EDUCATIO
d. Street Address:	162 PRETORIUS STREET PRESIDENT BUILDING PRETORIA
e. Postal Code:	
f. Telephone Number (Code + Ext):	012 401 6533
g. Fax Number:	N/A
h. E-mail address:	Mmapaseka.stephen@gauteng.gov.za sekamokhu345@gmail.com

2.7	**PERSAL Number (GDE employees only)**

9	0	1	8	7	5	5	5

3. **PROPOSED RESEARCH METHOD/S**

(Please indicate by placing a cross in the appropriate block whether the following modes would be adopted)

3.1. Questionnaire/s (If Yes, supply copies of each to be used)

YES		**NO**	

3.2. Interview/s (If Yes, provide copies of each schedule)

YES		**NO**	

3.3. Use of official documents

YES		**NO**	

If Yes, please specify the document/s:

3.4. Workshop/s / Group Discussions (If Yes, Supply details)

YES		**NO**	

3.5. Standardised Tests (e.g. Psychometric Tests)

YES		**NO**	
If Yes, please specify the test/s to be used and provide a copy/ies			

4. INSTITUTIONS TO BE INVOLVED IN THE RESEARCH

4.1. TYPE and NUMBER of Institutions (Please indicate by placing a cross alongside all types of institutions to be researched)

INSTITUTIONS	**Write NUMBER here**
Primary Schools	
Secondary Schools	4
ABET Centres	

ECD Sites	
LSEN Schools	
Further Education & Training Institutions	
Districts and / or Head Office	4

4.2. **Name/s of institutions to be approached for research (Please complete on a separate sheet if space is found to be insufficient).**

Name/s of Institution/s
4 DISTRICTS
4 SECONDARY SCHOOLS

4.3. **District/s where the study is to be conducted**. ***(Please indicate by placing a cross alongside the relevant district/s)***

District/s			
Ekurhuleni North		***Ekurhuleni South***	
Gauteng East		***Gauteng North***	
Gauteng West		***Johannesburg Central***	
Johannesburg East		***Johannesburg North***	
Johannesburg South		***Johannesburg West***	
Sedibeng East		***Sedibeng West***	
Tshwane North		***Tshwane South***	
Tshwane West			

If Head Office/s (Please indicate Directorate/s)
N/A

4.4. **Approximate number of learners to be involved per school (Please indicate the number by gender) N/A**

Grade	*1*		*2*		*3*		*4*		*5*		*6*	
Gender	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**
Number												

Grade	7		8		9		10		11		12	
Gender	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**	**B**	**G**
Number												**20**

4.5. Approximate number of educators/officials involved in the study (Please indicate the number in the relevant column)

Type of staff	*Educators*	*HODs*	*Deputy Principals*	*Principal*	*Lecturers*	*Office Based Officials*
Number	**44**			**4**		**4**

4.6 Letters of Consent (Attach copies of Consent letters to be used for Principal, SGB and all participants. For learners also include parental consent letter)

4.7 Are the participants to be involved in groups or individually?

Groups		***Individually***	

4.8 Average period of time each participant will be involved in the test or other research activities (Please indicate time in minutes for ALL participants)

Participant/s	Activity	Time
Subject advisors, School principals ,Teachers	**Individual Interviews**	**(60x12=600)**
Focus groups	**Group Interviews**	

4.9 Time of day that you propose to conduct your research.

***Before** school hours*		*During school hours (for **limited** observation only)*		***After** School Hours*	

SEE Condition 5.4 on Page 7

4.10 School term/s during which the research would be undertaken

First Term		***Second Term***		***Third Term***	

5. CONDITIONS FOR CONDUCTING RESEARCH IN GDE

Permission may be granted to proceed with the above study subject to the conditions listed below being met and permission may be withdrawn should any of these conditions be flouted:

5.1 The District/Head Office Senior Manager/s concerned, the Principal/s and the chairperson/s of the School Governing Body (SGB.) must be presented with a copy of this letter.

5.2 The Researcher will make every effort to obtain the goodwill and co-operation of the GDE District officials, principals, SGBs, teachers, parents

and learners involved. Participation <u>is voluntary</u> and additional remuneration will not be paid;

5.3 Research may only commence from the second week of February and must be concluded by the end of the THIRD quarter of the academic year. If incomplete, an amended Research Approval letter may be requested to conduct research in the following year.

5.4 Research may only be conducted <u>BEFORE or AFTER</u> school hours so that the normal school program is not interrupted. The Principal and/or Director must be consulted about an appropriate time when the researcher/s may carry out their research at the sites that they manage.

5.5 Items 3 and 4 will not apply to any research effort being undertaken on behalf of the GDE. Such research will have been commissioned and paid for by the Gauteng Department of Education.

5.6 It is the researcher's responsibility to obtain written consent from the SGB/s; principal/s, educator/s, parents and learners, as applicable, before commencing with research.

5.7 The researcher is responsible for supplying and utilizing his/her own research resources, such as stationery, photocopies, transport, faxes and telephones and should not depend on the goodwill of the institution/s, staff and/or the office/s visited for supplying such resources.

5.8 All research conducted in GDE Institutions is anonymous. The names and personal details of the GDE officials, schools, principals, parents, teachers and learners that participate in the study may neither be asked nor appear in the research title, report / thesis/ dissertation or GDE Research Summary.

5.9 On successful completion of the study the researcher must supply the Director: Education Research and Knowledge Management, with electronic copies of the Research Report, Thesis, Dissertation as well as a Research Summary (on the GDE Summary template). Failure to submit these

documents may result in future permission being withheld, or a fine imposed for BOTH the Researcher and the Supervisor.

5.10 Should the researcher have been involved with research at a school and/or a district/head office level, the Director/s and school/s concerned must also be supplied with a GDE Summary.

5.11 The researcher may be expected to provide short presentations on the purpose, findings and recommendations of his/her research to both GDE officials and the schools concerned;

6. DECLARATION BY THE RESEARCHER	
6.1 I declare that all statements made by myself in this application are true and accurate.	
6.2 I have read, understand and accept ALL the conditions associated with the granting of approval to conduct research in GDE Institutions and I undertake to abide by them. I understand that failure to comply may result in permission being withdrawn, further permission being withheld, a fine imposed and legal action may be taken against me. This agreement is binding.	
6.3 I promise once I have successfully completed my studies, (before graduation) or on successful project completion, to submit electronic copies of my Research Report / Thesis / Dissertation as well a GDE Summary on the GDE template sent to me with my approval letter or found on www.education.@gpg.gov.za	
Signature:	
Date:	**14 February 2017**
7. DECLARATION BY SUPERVISOR / LECTURER / PROMOTER	
7.1 I declare that: (Name of <u>Researcher</u>) ***Magdeline Mmapaseka***	

Stephen…………………………………………………………………………………………
7.2 <u>is enrolled at the institution</u> / employed by the organisation to which the undersigned is attached.
7.3 The <u>questionnaires</u> / <u>structured interviews</u> / tests meet the criteria of: • ***Educational Accountability;*** • ***Proper Research Design;*** • ***Sensitivity towards Participants;*** • ***Correct Content and Terminology;*** • ***Acceptable Grammar;*** • ***Absence of Non-essential / Superfluous items;*** • ***Ethical clearance***
7.4 The <u>student</u> / researcher has agreed to ALL the conditions of conducting research in GDE Institutions and will abide by them.
7.5 will ensure that after success completion of the research degree / project / study an electronic copy of the Research Report / Thesis / Dissertation and a Research Summary (on the GDE template) will be sent to the GDE. Failure to submit the Research Report, Thesis, Dissertation and Research Summary may result in: permission being withheld from BOTH the student and the Supervisor in future and a fine may be imposed.

7.6 Surname:	**Stephen**
7.7 First Name/s:	**Magdeline Mmapaseka**
7.8 Title:	**Mrs**
7.9 Institution / Organisation:	**UNISA**
7.10 Faculty / Department:	**Edication**
7.11 Telephone:	**072 691 5562**
7.12 E-mail address:	**sekamokhu345@gmail.com**

	Mmapaseka.stephen@gmail.com
7.13 Signature:	
7.14 Date:	**14 February 2017**

GROUP RESEARCH

This information must be completed by every researcher/ student / field worker who will be visiting GDE Institutions for research purposes, besides the main researcher who applied and the Supervisor/ lecturer / Promoter of the research.

By signing this declaration, the researcher / students / fieldworker accepts the conditions associated with the granting of approval to conduct research in GDE Institutions and undertakes to abide by them.

Supervisor/ Promoter / Lecturer's Surname and Name…Prof. Abram Motlhabane………… ………………

DECLARATION BY RESEARCHERS / STUDENTS:

Surname & Initials	Name	Tel	Cell	Email address	Signature

STEPHEN	MAGDELINE MMAPASEKA		072 691 5562	sekamokhu345@gmail.com	

N.B. This form (and all other relevant documentation where available) may be completed and forwarded electronically to Diane.Buntting@gauteng.gov.za and please copy (cc) ResearchInfo@gauteng.gov.za. The last 2 pages of this document must however have the original signatures of both the researcher and his/her supervisor or promoter. It should be scanned and emailed, posted or hand delivered (in a sealed envelope) to Diane Buntting, Room 509, 111 Commissioner Street, Johannesburg. All enquiries pertaining to the status of research requests can be directed to Diane Buntting on tel. no. 011 843 6503.

Other Information:

i) On receipt of all emails, confirmation of receipt will be sent to the researcher. The researcher will be contacted via email if any documents are missing or if any additional information is needed.

ii) If the GDE Research request submitted is approved, a GDE Research Approval letter will be sent by email to the researcher as well as the Supervisor / Lecturer / Promoter. Please ensure that your email address is correct.

iii) After successful completion of your research, please send your Research Reports / Thesis / Dissertations and GDE Research Summaries (on the template provided to both the Researcher and the Supervisor with the GDE Research Approval letter) to the same addresses as the GDE Research Request documents were sent to, namely: Diane.Buntting@gauteng.gov.za and please copy (cc) ResearchInfo@gauteng.gov.za

ANNEXURE B: GDE Approval letter

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

For administrative use:
Reference no. M2017/407

GDE RESEARCH APPROVAL LETTER

Date:	17 February 2017
Validity of Research Approval:	06 February 2017 – 29 September 2017
Name of Researcher:	Stephen M.M
Address of Researcher:	101 Chosen House flats
	214 Rissik Street
	Sunnyside , 0002
Telephone Number:	072 691 5562
Email address:	sekamokhu345@gmail.com
Research Topic:	The Pedagogy Of Physical Science Subject Advisors - Its Role In Enhancing The Quality Of Physical Science
Number and type of schools:	Four Secondary Schools
District/s/HO	Gauteng North ,Tshwane North, Tshwane South And Tshwane West

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted.

20/02/2017

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

Making education a societal priority

Office of the Director: Education Research and Knowledge Management
7th Floor, 17 Simmonds Street, Johannesburg, 2001
Tel: (011) 355 0488
Email: Faith.Tshabalala@gauteng.gov.za
Website: www.education.gpg.gov.za

ANNEXURE C: Ethical Clearance certificate

UNISA
university of south africa

COLLEGE OF EDUCATION RESEARCH ETHICS REVIEW COMMITTEE

19 October 2016

Ref : **2016/10/19/31637914/06/MC**
Student: Mrs MM Stephen
Staff Number : 31637914

Dear Mrs Stephen

Decision: Approved

Researcher: Mrs MM Stephen
Tel: +2772 691 5562
Email: sekamokhu345@gmail.com

Supervisor: Prof. AT Motlhabane
College of Education
Department of Science Technology Education
Tel: +2712 429 2840
Email: motlhat@unisa.ac.za

Proposal: The role of Physical Science subject advisors in enhancing the quality of teaching Physical Science in the FET Phase (Grade 10–12)

Qualification: D Ed in Curriculum Studies

Thank you for the application for research ethics clearance by the College of Education Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the research.

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the College of Education Research Ethics Review Committee on 19 October 2016.

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the College of Education Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*
3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

Note:

The reference number **2016/10/19/31637914/06/MC** *should be clearly indicated on all forms of communication (e.g. Webmail, E-mail messages, letters) with the intended research participants, as well as with the College of Education RERC.*

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone +27 12 429 3111 Facsimile +27 12 429 4150
www.unisa.ac.za

Kind regards,

Dr M Claassens
CHAIRPERSON: CEDU RERC
mcdtc@netactive.co.za

Prof VI McKay
EXECUTIVE DEAN

ANNEXURE D: Request for permission to conduct study: Provincial Education Department

Request for permission to conduct research with subject advisors at Gauteng Department of Education on the following topic:

“**The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**

Date: 14 February 2017

To: The HR Manager

Gauteng Department of Education – Head office

Dear sir/Madam

I, Magdeline Mmapaseka Stephen am doing research with Professor AT Motlhabane, an associate professor in the Department of Science and Technology Education, College of Education towards a D Ed at the University of South Africa. I hereby wish to request your permission to conduct a study entitled: “**The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**” at the Tshwane districts in Gauteng province.

The aim of the study is to investigate the perception of subject advisors, school principals and Physical Science teachers on the role played by subject advisors to improve the quality of Physical Science results at schools.

Your department has been selected because of its convenience for the researcher in collecting data.

The study will entail interviews with subject advisors, observation of subject advisors activities during school visits, interviews with school principals, interviews with participating teachers at schools and focus group interviews with teachers.

The benefits of this study are to assist in clarifying the roles of subject advisors on the importance of subject advisory for quality Physical Science results.

All information obtained from the district and schools will be held in strict confidence before destroying it after five years. The participants in this study will remain anonymous and the potential risk in this study is discomfort; however participants will be informed that they can withdraw at anytime without being penalized. A copy of the final document will be made available to the Gauteng Department of Education and to the district upon request.

The data will be used solely to compile the dissertation for the Doctoral study with specialization in Curriculum Studies. The dissertation will therefore be read by examiners and the academic community. The findings will also be used for publication in academic journals and for presentation at academic conferences.

I will follow the University of South Africa research ethics regulations and will use the information for the purposes of this study only. Participation is voluntary; participants may withdraw their participation at any stage during the research process, prior to the reporting of the findings for the project.

Also note that your name, the name of your institution and other participants’ names will be withheld in the reporting of the data. No information shared will be disclosed to members of staff at the University in a way that will allow them to identify the name of the institution which participated in the research. As such, confidentiality and anonymity will be guaranteed. If you will agree to participate in this research, please sign this letter as a declaration of your consent.

PARTICIPANT (HR MANAGER)	....
SIGNATURE:	....
DATE:	....
RESEARCHER'S SIGNATURE:	....
DATE:	..........14 FEBRUARY 2017......................

Furthermore, to collect research data it is sometimes necessary to use a voice recorder so that no important information is lost before it can be captured and reported. Again, these recordings will only be used for the purpose of this research and not for any other purposes. If you agree to the use of such devices during the research in your district offices and schools, please sign the second acknowledgement of your consent to the use of these recorders below:

PARTICIPANT' (DISTRICT DIRECTOR)	………………………………
SIGNATURE:	....
DATE:	....
RESEARCHER'S SIGNATURE:	... .
DATE:	.......14 FEBRUARY 2017......................

Should you have any questions about the research and/ or the contents of this letter, please do not hesitate to contact me for further information.

Thanking you for your kind consideration of the above.

Yours sincerely

Signature:___ ________________________

Name: Magdeline Mmapaseka Stephen

Physical Science Senior Education Specialist (Tshwane South District)

ANNEXURE E: Request for permission to conduct study: District office

Request for permission to conduct research at a district office in Gauteng province on the following topic:

"**The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**

Date: 14 February 2017

To: The district director

Gauteng Department of Education – Tshwane District

Dear District sir/madam

I, Magdeline Mmapaseka Stephen am doing research with Professor AT Motlhabane, an associate professor in the Department of Science and Technology Education, College of Education towards a D Ed at the University of South Africa. I hereby wish to request your permission to conduct a study entitled: "**The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**" at the Tshwane districts in Gauteng province.

The aim of the study is to investigate the perception of subject advisors, school principals and Physical Science teachers on the role played by subject advisors to improve the quality of Physical Science results at schools.

Your district has been selected because of its convenience for the researcher in collecting data.

The study will entail interviews with subject advisors, observation of subject advisors activities during school visits, interviews with school principals, interviews with participating teachers at schools and focus group interviews with teachers.

The benefits of this study are to assist in clarifying the roles of subject advisors on the importance of subject advisory for quality Physical Science results.

All information obtained from the district and schools will be held in strict confidence before destroying it after five years. The participants in this study will remain anonymous and the potential risk in this study is discomfort; however participants will be informed that they can withdraw at any time without being penalized. A copy of the final document will be made available to the Gauteng Department of Education and to the district upon request.

The data will be used solely to compile the dissertation for the Doctoral study with specialization in Curriculum Studies. The dissertation will therefore be read by examiners and the academic community. The findings will also be used for publication in academic journals and for presentation at academic conferences.

I will follow the University of South Africa research ethics regulations and will use the information for the purposes of this study only. Participation is voluntary; participants may withdraw their participation at any stage during the research process, prior to the reporting of the findings for the project.

Also note that your name, the name of your institution and other participants' names will be withheld in the reporting of the data. No information shared will be disclosed to members of staff at the University in a way that will allow them to identify the name of the institution which participated in the research. As such, confidentiality and anonymity will be guaranteed. If you will agree to participate in this research, please sign this letter as a declaration of your consent.

PARTICIPANT (DISTRICT DIRECTOR)	
SIGNATURE:	....
DATE:	....
RESEARCHER'S SIGNATURE:	
DATE:	...14 FEBRUARY 2017...

Furthermore, to collect research data it is sometimes necessary to use a voice recorder so that no important information is lost before it can be captured and reported. Again, these recordings will only be used for the purpose of this research and not for any other purposes. If you agree to the use of such devices during the research in your district offices and schools, please sign the second acknowledgement of your consent to the use of these recorders below:

PARTICIPANT' (DISTRICT DIRECTOR)	………………………………
SIGNATURE:	....
DATE:	....
RESEARCHER'S SIGNATURE:	.. ..
DATE:	..14 FEBRUARY 2017..........................

Yours sincerel

Signature:__ __________________________

Name: Magdeline Mmapaseka Stephen

Physical Science Senior Education Specialist (Tshwane South District)

ANNEXURE F: Request for permission to conduct study: Public school

Request for permission to conduct research at a school in Gauteng province on the following topic:

"**The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**

Date: 14 February 2017

To: The principal

Dear Sir/Madam

I, Magdeline Mmapaseka Stephen am doing research with Professor AT Motlhabane, an associate professor in the Department of Science and Technology Education, College of Education towards a D Ed at the University of South Africa. I hereby wish to request your permission to conduct a study entitled: "**The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**" at the Tshwane districts in Gauteng province.

The aim of the study is to investigate the perception of subject advisors ,school principals and Physical Science teachers on the role played by subject advisors to improve the quality of Physical Science results at schools.

Your district has been selected because of its convenience for the researcher in collecting data.

The study will entail interviews with subject advisors, observation of subject advisors activities during school visits, interviews with school principals, interviews with participating teachers at schools and focus group interviews with teachers.

The benefits of this study are to assist in clarifying the roles of subject advisors on the importance of subject advisory for quality Physical Science results.

All information obtained from the district and schools will be held in strict confidence before destroying it after five years. The participants in this study will remain anonymous and the potential risk in this study is discomfort; however participants will be informed that they can withdraw at any time without being penalized. A copy of the final document will be made available to the Gauteng Department of Education and to the district upon request.

The data will be used solely to compile the dissertation for the Doctoral study with specialization in Curriculum Studies. The dissertation will therefore be read by examiners and the academic community. The findings will also be used for publication in academic journals and for presentation at academic conferences.

I will follow the University of South Africa research ethics regulations and will use the information for the purposes of this study only. Participation is voluntary; participants may withdraw their participation at any stage during the research process, prior to the reporting of the findings for the project.

Also note that your name, the name of your institution and other participants' names will be withheld in the reporting of the data. No information shared will be disclosed to members of staff at the University in a way that will allow them to identify the name of the institution which participated in the research. As such, confidentiality and anonymity will be guaranteed. If you will agree to participate in this research, please sign this letter as a declaration of your consent.

PARTICIPANT (PRINCIPAL)	
SIGNATURE:	....
DATE:	....
RESEARCHER'S SIGNATURE:	... .
DATE:	...14 FEBRUARY 2017............................

Furthermore, to collect research data it is sometimes necessary to use a voice recorder so that no important information is lost before it can be captured and reported. Again, these recordings will only be used for the purpose of this research and not for any other purposes. If you agree to the use of such devices during the research in your district offices and schools, please sign the second acknowledgement of your consent to the use of these recorders below:

PARTICIPANT' (PRINCIPAL)	………………………………
SIGNATURE:	....
DATE:	....
RESEARCHER'S SIGNATURE:	....
DATE:	.14 FEBRUARY 2017............................

Yours sincerely

Signature:___ ________________________

Name: Magdeline Mmapaseka Stephen

Physical Science Senior Education Specialist (Tshwane South District)

ANNEXURE G: PARTICIPANT INFORMATION SHEET

14 February 2017

Title: **The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**

Dear Prospective Participant

My name is Magdeline Mmapaseka Stephen and I am doing research with Professor AT Motlhabane, an associate professor in the Department of Science and Technology Education, College of Education towards a D Ed, at the University of South Africa. I am inviting you to participate in a study entitled: "**The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**."

THE PURPOSE OF THIS STUDY

The purpose of the study is to investigate the perception of subject advisors ,school principals and Physical Science teachers on the role played by subject advisors to improve the quality of Physical Science results at schools.

MY REASONS FOR REQUESTION YOUR PARTICIPATION

Your contact details were obtained from the Gauteng Education provincial DCES
You were chosen for this study because of your experience (more than three years) in the field which is under research and your engagement with school principals and teachers in your line of duty.

In addition to your availability for this study, there are three other subject advisors , four school principals, six Physical Science teachers and 4 focus groups with ten teachers each who are sampled for this study.

THE NATURE OF YOUR PARTICIPATION IN THIS STUDY

Your role is to answer interview questions as honest as possible and to allow the researcher to visit a school with you and observe you on a normal school day.

The study involves focus groups interviews during your district subject meeting and unstructured interview questions with you*.*

Interview questions are aimed at answering these questions:

- How do Physical Science subject advisors perceive their roles at schools as playing a significant role in improving the quality of Physical Science teaching?

- How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?

Expected duration of participation and the time needed to complete specific research activities like focus groups or interviews:

Interview with subject advisors will take place on a day and time convenient for them for an hour in the first tem of 2017

Observations during school visit will take place during the subject advisors routine school visit at school participating in the study in the first tem of 2017

Focus group interviews will take place at a support group meeting of your choice, in the first tem of 2017 for at most two hours.

WITHDRAWAL FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE

.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY

There are no tangible benefits from participating in the study except some knowledge gained from answering questions.

Data collected might assist in reflecting on your everyday roles as a curriculum manager.

NEGATIVE CONSEQUENCES FOR PARTICIPANTS IF THEY PARTICIPATE IN THE RESEARCH PROJECT

There might be some inconvenience in terms of time sacrificed to answer interview questions and some discomfort when the researcher visits the school with you for observation on everyday activities as well as the researchers presence at focus group meetings.

There are no harm anticipated.

CONFIDENTIALITY OF INFORMATION

All Information conveyed is confidential and can be requested at the end of the study. No real name will be used in the study but codes ONLY.
Only the researcher and the supervisor will have access to data collected form the duration of the study. A confidentiality agreement will be signed.

Data collected for this study might be used for other purposes, such as a research report, journal articles and/or conference proceedings however no one will be in a position to identify participants who provided information since ONLY codes will be used for participants.

For Focus groups

The focus groups where data will be collected are support group meetings for Physical Sciences
While every effort will be made to ensure that participants will not be connected to the information that they share during the focus group, I cannot guarantee that other participants in the focus group will treat information confidentially. I shall, however, encourage all participants to do so. For this reason I advise you not to disclose personally sensitive information in the focus group.

PROTECTING THE SECURITY OF DATA

All data collected will be typed, saved in a file which will be saved in disc or hard drive in a password protected computer for retrieval when requested. Hard copies of information that was collected during interviews and observations will be stored away for at most five years in a locked place at home**.**
Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Indicate how information will be destroyed if necessary *(e.g. hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme)*.

REMUNERATION FOR PARTICIPATING IN THIS STUDY

There is no remuneration for participating in this study in any form.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review. An approval letter is available.

THE FINDINGS/RESULTS OF THE RESEARCH

If you would like to be informed of the final research findings, please contact professor AT Motlhabane on 012 429 2840 or email motlhat@unisa.ac.za. The findings will be accessible after completion and publication for the study.

Should you require any further information or want to contact the researcher about any aspect of this study, please contact Magdeline Mmapaseka Stephen at 072 691 5562 or sekamokhu345@gmail.com.

Should you have concerns about the way in which the research has been conducted, you may contact professor AT Motlhabane at 0124292840 or motlhat@unisa.ac.za.

Thank you for taking time to read this information sheet and availing yourself to participate in this study.

Thank you.

Signature_ ____________________

Name: M M Stephen

ANNEXURE H: REQUEST TO CONDUCT INTERVIEW

LETTER REQUESTING AN ADULT TO PARTICIPATE IN AN INTERVIEW

Dear participant

This letter is an invitation to consider participating in a study I, Magdeline Mmapaseka Stephen am conducting as part of my research as a doctoral student **The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science** at the University of South Africa. Permission for the study has been given by Gauteng Department of Education and the Ethics Committee of the College of Education, UNISA. I have purposefully identified you as a possible participant because of your valuable experience and expertise related to my research topic.

I would like to provide you with more information about this project and what your involvement would entail if you should agree to take part. The importance of subject advisory in education is substantial and well documented. For quality education research worldwide has indicated that external intervention by education managers to supervise can improve the performance of learners. In this interview I would like to have your views and opinions on this topic. This information can be used to improve in understanding the roles of subject advisors at schools.

Your participation in this study is voluntary. It will involve an interview of approximately *120* minutes in length to take place in a mutually agreed upon location at a time convenient to you. You may decline to answer any of the interview questions if you so wish. Furthermore, you may decide to withdraw from this study at any time without any negative consequences.

With your kind permission, the interview will be audio-recorded to facilitate collection of accurate information and later transcribed for analysis. Shortly after the transcription has been completed, I will send you a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or to clarify any points. All information you provide is considered completely confidential. Your name will not appear in any publication resulting from this study and any identifying information will be omitted from the report. However, with your permission, anonymous quotations may be used. Data collected during this study will be retained on a password protected computer for 5 years in my locked office. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at 072 691 5562 or by e-mail at sekamokhu345@gmail.com.

I look forward to speaking with you very much and thank you in advance for your assistance in this project. If you accept my invitation to participate, I will request you to sign the consent form which follows on the next page.

Yours sincerely

___Magdeline Mmapaseka Stephen___  _________

****

ANNEXURE I: CONSENT FORM

I have read the information presented in the information letter about the study entitled: **The pedagogy of physical science subject advisors - its role in enhancing the quality of Physical Science**. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and add any additional details I wanted. I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses. I am also aware that excerpts from the interview may be included in publications to come from this research, with the understanding that the quotations will be anonymous. I was informed that I may withdraw my consent at any time without penalty by advising the researcher. With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

Participant's Name (Please print):__ ____________________________

Participant Signature: _______________________________________

Researcher Name: (Please print)M M STEPHEN ________________________

Researcher Signature: _ ______________________________________

Date: _14 February 2017____

ANNEXURES J: QUESTIONNAIRES

ANNEXURES J-1: QUESTIONNAIRES FOR THE PHYSICAL SCIENCE PROVINCIAL DCES

QUESTIONS	**RESPONSE**
How many Physical Science subject advisors are there in the Gauteng province	26
What are the expected qualifications of a Physical Science subject advisor when they enter the system?	HONOURS DEGREE
How can you rate the performance of the Gauteng Physical Science subject advisors in the past three years?	• Below expectations • Satisfactory • Excellent
How do you rate the impact of the current cohort of Physical Science subject advisors on the overall provincial results in the past three years	• Below expectations • Satisfactory • Excellent
Do you think that Physical Science subject advisors understand their roles in improving the quality of Physical Science teaching	• Most of them understand • At most half of them understand • Not sure
Do all Physical Science subject advisors have sufficient Content knowledge to support and develop Grade 10-12 Physical Science teachers at schools	• Most of them have sufficient content knowledge • At most half of them • Not sure
Rate the overall competency of Physical Science subject advisors	• Highly competent • Moderately competent • Mostly incompetent

Rate the overall attitude and interest of Physical Science subject advisors	• Positive attitude and very interested in improving the performance in the subject • Moderate attitude and seldom interested in improving the performance in the subject the subject. • Negative attitude and not interested in improving the performance in the subject
How conversant are Physical Science subject advisors with subject policies and encourage its implementation at schools	• Most of them are knowledgeable with the CAPS policy document and encourage its implementation at schools. • At most half of them are knowledgeable with the CAPS policy document and encourage its implementation at schools. • Not sure if subject advisors are knowledgeable with the CAPS policy document and encourage its implementation at schools

ANNEXURES J-2: QUESTIONAIRES FOR SUBJECT ADVISORS

QUESTIONS	**RESPONSE**
PERSONAL QUALITIES, EXPERIENCE AND PROFESSIONAL QUALIFICATIONS	
Indicate your professional qualification	DIPLOMA
	DIPLOMA + ACE
	BA/BA.ED
	BED
	BSC
	BTECH
	HONOURS
	M.ED
	DED/PHD
	OTHER
What are your highest specialization subjects at tertiary institution?	**(Circle all appropriate subject) add professional qualifications** Mathematics Physical Science Physical Chemistry Other: specify here

How many years were you a Physical Science teacher/HoD in the FET phase before being appointed as a Physical Science subject advisor?	**(circle only one response)** 0-5 years 5-10 years 10-15 years 15-20 years 20 years and above
How many years have you been a subject advisor for Physical Science	**(circle only one response)** 0-5 years 5-10 years 10-15 years 15-20 years 20 years and above
Do you think that as a subject advisor the relationship that you have with teachers may influence the quality of their teaching?	**(circle only one response)** Agree Nor agreed To some extend Not sure
SUBJECT ADVISORS' ROLES	
Do subject advisors roles include the subject assigned to them **ONLY**?	**(circle only one response)** Yes or NO
If subject advisors responsibility include other work **outside of the subject** assigned to you, answer the questions below	

What impact does the other work assigned to Physical Science subject advisors have on the time spent in supporting the teaching of Physical Science.	**(circle only one response)** • Takes a lot of time on the support for Physical Science • Has little influence the support for Physical Science • Does not affect the support for Physical Science
Do you think your roles are sufficient to improve the quality of teaching of Physical Science or is there more required?	**(circle only one response)** Insufficient Sufficient Write other roles that you would want to be added if your answer is **"insufficient)**
SUBJECT ADVISORS' CONTENT AND PEDAGOGICAL CONTENT KNOWLEDGE	
Rate your Physical Science content and pedagogical content knowledge required for the grades assigned to you (Grade 10-12)	**(circle only one response)** Sufficient for Grade 10 ONLY Sufficient for Grade 11 ONLY Sufficient for Grade 12 ONLY Sufficient for all Grade 10-12
Rate the support of Physical Science subject advisors in supporting Grade 10-12 teachers	**(circle only one response)** More effective in Grade 10 More effective in Grade 11 More effective in Grade 12 Effective in all grades 10-12

SUBJECT ADISORS VIEW ON THE IMPACT OF THEIR ROLES AT SCHOOLS	
Write the pass rate of the Physical Science results in your district in the years given	2012 2013 2014 2015: 67,5% 2016: 71,6%
Since you appointment as a subject advisor, has the quality of teaching of the Grade 10-12 Physical Science teachers improved	**(circle only one response)** Yes or No
Are you satisfied with the support they get from you	**circle only one response)** Yes No Not sure
Are the Physical Science teachers at schools satisfied with the support they get from you	**(circle only one response)** Yes No Some are satisfied, some are not Not sure
If there are issues that you would want subject advisors to improve or do different for your Physical Science teachers, mention them	**Areas of improvement for subject advisors or things to be done differently:**
Subject advisors activities when they visits schools	
Rate your impact as subject advisors have on the following aspects of curriculum	

support	
Activity	Rate the support offers by the subject advisor as: Satisfactory, Acceptable or Not done
Planning	Satisfactory
Curriculum coverage	Satisfactory
Quality and quantity of assessment tasks	Satisfactory
Instructional leadership	Satisfactory
Affective use of instructional time	Satisfactory
Classroom management (during a Science period)	Satisfactory
Correct use of the language of instructions	Satisfactory
Effective use of teaching resources	Satisfactory
Curriculum compliance	Satisfactory

ANNEXURES J-3: QUESTIONNAIRES FOR SCHOOL PRINCIPALS

QUESTIONS	**RESPONSE**
How many years have you been the principal at this school	0-5 years 5-10 years 10-15 years 15-20 years 20 years and above
Write the pass rate of the Physical Science results in your district in the years given	2012 2013: 2014: 2015: 2016:
Rate the quality of Physical Science teaching in the FET phase	**(circle only one response)** Acceptable Satisfactory Excellent
Are all the Grade 10-12 Physical Science teachers qualified to teach Physical Science in the FET phase	**(circle only one response)** Yes No Some are qualified ,some are not Not sure
How often do Physical Science subject advisors come to your school in each term of the year to support Physical Science teachers with content and pedagogical content knowledge?	**(circle only one response)** Between 0-3 times Between 3-5 times More than 5 times

Mention specific subject related tasks that subject advisors do when they visit schools to support Physical Science teachers.	They: check the classwork books and give advice
How do you rate the quality of teaching of the Grade 10-12 Physical Science teachers since their Physical Science subject advisors have been working with them	**(circle only one response)** Acceptable Satisfactory Excellent
How do you deal with Physical Science challenges at your school	**(circle only one response)** Deal with them myself/with the SMT Work with the subject advisor Give the problem to the subject advisor to solve
Do you think that your teachers are happy to work with the Physical Science subject advisor	**(circle only one response)** Yes No Not sure
How do assist Physical Science teachers when they need help with content or pedagogical content knowledge in the case where the subject advisor is not immediately available?	**(circle only one response)** Help them myself/with the SMT Ask the help from a school or a neighboring school Wait for the subject advisor the day he/she comes

How do you rate the competency of most Physical Science teachers to teach Grade 10-12 in your district.	**(circle only one response)** Mostly competent At most 50% competent and 50% incompetent Mostly incompetent

ANNEXURES J-4: QUESTIONNAIRES FOR PHYSICAL SCIENCE TEACHERS

QUESTIONS	RESPONSE
PERSONAL QUALITIES, EXPERIENCE AND PROFESSIONAL QUALIFICATIONS	
What were your specialization subjects at tertiary institution?	(Circle all appropriate subject) Mathematics Physical Science Physics Chemistry Other: specify here
How many years were you a Physical Science teacher/HoD in the FET phase?	**(circle only one response)** 0-5 years 5-10 years 10-15 years 15-20 years 20 years and above
How many years have you worked with your Physical Science subject advisor (the years that he/she has been your subject advisor)	**(circle only one response)** 0-5 years 5-10 years 10-15 years 15-20 years 20 years and above

In which grades do you teach Physical science in your school?	**(Circle all appropriate grades)** Grade 10 Grade 11 Grade 12
Competency of the subject advisor	
How confident are you in the support you get from your subject advisor	**(circle only one response)** Very confident Seldom confident Not confident
What is your preferred choice of a subject manager who is more effective in supporting and developing you in Physical Science?	**(circle only one response)** My subject advisor My HoD Both my subject advisor and my HoD None between my subject advisor and my HoD
Do you regard the content and pedagogical content knowledge of your subject advisor to be enough to assist you to improve the quality of your teaching?	**(circle only one response)** 1-No 2- Almost 3- Yes
How do you rate the relationship between you and your subject advisor in terms of the influence in has on your teaching quality	**(circle only one response)** Acceptable Satisfactory Excellent

How do you rate the professional conduct of your subject advisor in his/her support for teachers	Highly professional Seldom professionally acceptable Unprofessional in most cases
Support offered by Physical Science subject advisors	
How do you rate the content and pedagogical content knowledge support of your Physical Science subject advisor for you in particular?	**(circle only one response)** 1-acceptable 2-Saticfactory 3-Excellent
How often do Physical Science subject advisors come to your school in each term of the year to support Physical Science teachers with content and pedagogical content knowledge?	Between 0-3 times Between 3-5 times More than 5 times
How do you rate the level of the improvement of the quality of your Physical Science teaching since your Physical Science subject advisors have been working with you	**(circle only one response)** Better than before The same Worse than before
Rate the impact of the support by the subject advisor on the following areas of curriculum support.	
Activity	**Rate the support offers by the subject advisor as: Satisfactory, Acceptable or Not done**
Planning	**Satisfactory**
Curriculum coverage	**Satisfactory**

Quality and quantity of assessment tasks	**Satisfactory**
Instructional leadership (teaching methods/styles)	**Satisfactory**
Affective use of instructional time	**Satisfactory**
Classroom management (during a Science period)	**Satisfactory**
Correct use of the language of instructions	**Satisfactory**
Effective use of teaching resources	**Satisfactory**
Curriculum compliance	**Satisfactory**

ANNEXURES K: INTERVIEWS

ANNEXURES K-1: INDIVIDUAL INTERVIEW QUESTIONS FOR SUBJECT ADVISORS

In trying to answer the question:

- **How do Physical Science subject advisors perceive their roles in improving the quality of Physical Science teaching?**

… the following questions were asked:

Are the roles of subject advisors consistent across the districts, understood by all subject advisors the same way and implemented consistently in all districts?

No. the various district directors demand different approaches. The schools are different and therefore we also have to approach the way we deal with schools differently. The subject advisors are different with different capabilities and different skills and approaches. The induction of subject advisors are not the same when they enter the system and therefore the roles are not understood in the same way.

Is there a correlation between documented roles of subject advisors and activities that district managers expect them to fulfil at schools?

No. The documented roles are stipulated in the rules and regulations from DoBE and also in the job description of subject advisors. Because we are humans, we interpret the roles differently. It also depends on the topic under discussion. The demand for reporting differs per term and also per time of the year. In the beginning of the year district managers demand diagnostic analysis of results and all kinds of activities that are not part and parcel of our normal roles, but it is expected to help with other units. Examples are 10th day head count or assessment monitoring or school readiness.

If there are roles of subject advisors at district level that are not necessarily subject related, how have they affected the effectiveness of subject advisors in improving the quality of teaching of Physical Science at schools and the performance of the subject?

We cannot perform our normal school support duties when other activities are demanded form subject advisors. The time to visit schools is very limited and if the time is utilized to its maximum we do not manage to support 100%.

Do you regard all activities that you have done at schools to be relevant in improving the quality of Physical Science teaching and performance? List exact activities that you think can improve subject support and the ones that you regard as deterrents to Physical Science subject support.

Yes. I think most activities are relevant, even if it is not actually in my job description, because we make contact with teachers and SMT in schools and build relationships. Examples that improve the subject are workshops, school visits, and PLC meetings, subject support meetings, including NGOs that are allowed to visit meetings and expose teachers to the products available on the market. Deterrents might be very longs meetings in the office that have nothing to do with the subject itself, meetings with head office (CIF) where no information is given to support us and just talking is taking place, reporting on activities as if the report will improve the quality of support.

What are the personal and professional qualities expected of subject advisor as an effective one?

Good qualifications. Good interpersonal relationships. Understanding of the education system, ability to improvise, ability to work under pressure, help and support with expected and unexpected challenges, such as qualified teachers with no scientific knowledge although they have a qualification. Understanding learners and the way they learn and their challenges. Good subject knowledge good communication skills.

What impact has the personal relationship between you and Physical Science teachers have on the quality of teaching of Physical Science?

Very big impact. My way of handling teachers, showing them respect is very important. My subject knowledge is very important because teachers rely on me when they experience challenges whether it is in content knowledge or whether it is a teaching methodology challenge.

What impact has your professional qualities have on the quality of teaching by Physical Science teachers at schools?

My subject knowledge and professional qualifications are part of the success of my relationship and the respect I get from my teachers. Without proper qualifications and content knowledge I cannot give the necessary guidance.

How consistent are the subject advisors expected to visit one school in a term?

Depending on the performance of the school I visit them more than once per term, up to 4 to 5 times to help and support and do follow up visits. A good performing school is visited at least once a term. If need be I will visit more.

What impact has the frequency of the support and development provided by subject advisors had on the quality of teaching of Physical Science?

It helps if you visit more than once, because the teachers are more aware of what they are supposed to do and they tend to change. If there is no follow-up visit, they ignore any comments written in a report.

Is there frequency of school visits enough in your opinion or is there room for Improvement? Why?

I think the frequency is enough, but some schools need more visits especially if there is more than one teacher in a school. Then more individual support is needed.

What measure have you employed to enhance the professional development of teachers in your districts?

Workshops, individual support during afternoon sessions on a one to one basis.

What impact has your intervention with teachers had on their quality of teaching and on the performance of Physical Science in the province in the past five years?

I think it has made an impact, because the teachers have more confidence, they also start to prepare in a more structured way and they also have more activities in the learner's books than in the early years

What role can subject advisors play to ensure that teachers commitment and interest in teaching Physical Science'.

Be positive. Improve their knowledge, build their confidence and continuously expose them to interesting science activities outside the class room and the world out there. Also expo and interesting projects are important.

What role do subject advisors play in the professional development of teachers?

Only when we train them during official sessions organized by the DoBE.

the impact of your intervention in Physical Science subject in your with regard to the following:

- The quality of Physical Science education in Gauteng province.

Exposure to marking and moderation has improved the quality of teaching.

- Minimum standards of Physical Science.

Exposure to additional worksheets and ICT from other sources has opened the eyes of teachers to more than just the curriculum content.

- Providing advice and guidance to Physical Science teachers.

This has given the teachers the opportunity to build a good relationship with me and they are not afraid to ask me anything and expose their own incompetency in content or teaching.

- Providing purposeful and constructive feedback to Physical Science teachers.

During meetings I discuss challenges and use report from DoBE and province to discuss challenges with teachers. Also during school visits I give them feedback to improve and during marking of books, moderation we discuss the challenges that they experience and I show them what is wrong and how to improve.

- Supporting Physical Science teachers to improving teaching and learning.

I am always available to support and willing to help. This positive attitude has had a positive effect on the teachers, but also on the learners. They know they can ask anytime and will get the necessary support to improve their teaching. Help with experiments, equipment and providing them with work sheets, additional support material and power point presentations and didactic challenges have made the teachers confident I the class room.

- Ensuring accountability by to Physical Science teachers.

This is a challenge, because teachers have a tendency to blame the learners and the system for their own incompetence's. They do not want to be held accountable for bad results and it is difficult to change their attitude. Some teachers have no real responsibility and will stay away from the class room and only teach half of the content and think this will satisfy learners because the learners do not know what they are supposed to study and understand.

Discuss In trying to answer the question:

- **What impact does the Physical Science subject advisors' content and pedagogical content knowledge have on quality of the teaching of Physical Science in the FET phase (grade 10-12)?**

This has a huge impact. This is a requirement for providing guidance and support

… the following questions were asked:

Which knowledge areas do you regard yourself as having sufficient content and pedagogical content knowledge to support grade 10-12 Physical Science teachers?

All topics in the curriculum, but I always prefer Chemistry.

Which knowledge areas do you require content and pedagogical content knowledge development to support grade 10-12 Physical Science teachers?

I always feel I need support on Mechanics

In the event where you have content limitations, how do you plan to close those gaps so that you can assist teachers with content?

Read and study on the topic until I am satisfied.

Which professional learning opportunities are available for subject advisors?

I am only aware of university degrees

Which of the professional learning opportunities have you taken advantage of and how have they affected your performance?

I studied at university and obtained the best qualification that was offered at that stage. I paid for it myself and managed to pass well in the minimum time.

What are your observations on the content and pedagogical content knowledge of Physical Science teachers in grade 10-12?

Teachers have the relevant qualifications, but cannot apply their knowledge. The content of many of the courses attended are not good. Many teachers were condoned at university and many of them only studied education because they obtained a bursary and are not really interested in teaching as a career.

In the event where teachers have content or pedagogical content knowledge gaps, what kind of intervention strategies do you employ to assist such teachers?

I support them by helping them to plan and prepare lessons, provide them with workshops to improve their subject knowledge.

How has the intervention with schools in your district influenced teachers' content and pedagogical content knowledge in the years that you have worked with teachers?

I think it is made an impact; the problem is that every year you start afresh because of the turnover of teachers.

What impact has curriculum changes had on the quality of Physical Science teaching at the schools in the district?

The quality has improved through the years, especially with teachers that are quite sometime in the system. Many of my Physical Science teachers have obtained promotion posts and are HODs, or deputy principals or are already principals.

How is your observation on the attitude of school principals towards Physical Science subject advisors?

They are positive towards me.

How has the attitude of principals affected your work at the schools?

I am allowed to enter the class rooms at any time.

How involved are school principals in assisting Physical Science subject advisors to reinforce their support for teachers?

Not very much. They only listen to the report, but for the rest there is not very much support to change the schools attitude.

How has the involvement of school principals affected the performance of Physical Science at schools in the past five years?

Not very much. The subject is regarded as a poor performing subject, but does not receive any special support or attention.

Which challenges have you faced about school principals at schools and how have they been dealt with?

The biggest challenge is that no equipment is ever ordered or special rooms made available to become laboratories. The timetable is also not extended to include extra periods to help and support teachers with extra lessons.

What is your observation on the attitude of teachers towards Physical Science subject advisors?

I do not find any negativity.

How has the attitude of teachers affected your work at the schools?

I get a positive welcome and not negative attitude from teachers. I find I can come and do my job in supporting them.

How committed are school principals and teachers in improving the performance of Physical Science in the FET phase at their schools?

No real commitment

Comment on the roles played by other district structures in supporting subject advisors to effectively improve the quality of the subject?

Teacher development can increase their support by providing money to obtain NGOs to also help with training. No money is available even for lunch! There is not even paper for hand outs at work shops.

What are challenges that you encounter about teachers that negatively impacts on the quality of their teaching and the performance of learners? How do you deal with challenges?

Teachers do not do proper preparation and plan per period. They also do not try to improve their knowledge by reading more about a topic (not for qualification purposes) but just to make the subject more interesting. They are not interested to give more of their time to start a science club or use their own resources to use for improvised equipment. Teachers also do the marking in the class by simply placing their signature next to an activity, but they do not read the responses of the learners and do not really care if there are gaps in the learners' knowledge or books and no roper corrections are done. The discipline in the class room is also not adequate. Tables and chairs are not neatly organized, learners sit and just watch the teacher teaching without books on the tables and the teacher does not reprimand the learners.

What are challenges that you encounter about school principals that negatively impacts on learner performance? How do you deal with challenges?

Principals do not really discipline learners and are not really aware of what is happening in a class room

Which other challenges are faced by subject advisors that hinder them from effective Physical Science subject support?

At some schools you find that learners are not at schools because they are taken to attend an expo or a sporting activity in school hours. The time table is sometimes shortened for extra mural activities and this is done without regarding the notional time of teachers teaching a subject that is overloaded and need every minute.

If there is a room for suggested improvement on the roles of subject advisors, what would you want them to be and how do you think it would impact the performance of Physical Science in the province?

We need to be on top of our subject knowledge. We need to have space to guide our teachers without any interference from other units that take up our time. We need to understand the teacher very well and support them on an individual basis. The reporting on compliance is not as important as support on content and didactic knowledge and skills improvement.

ANNEXURES K-2: INDIVIDUAL INTERVIEW QUESTIONS FOR SCHOOL PRINCIPALS

In trying to answer the question:

- **What are the views of School principals on the role that Physical Science subject advisors have in enhancing the quality of the teaching of Physical Science in the FET phase (grade 10-12).**

  … the following questions were asked :

What is your view on the relevance of subject advisor on the current education system?

We need subject advisors, they are subject specialists, they help prepare teachers to teach according to the ATP.

What is the impact that Physical Science subject advisors have on the quality on the teaching of Physical Science teaching and the quality of Physical results?

Yes, they advise teachers and do follow up visits .If something is wrong, they come again

List exact activities that subject advisors are do when they visit your schools?

They check learners' books, they check the ATP coverage and sometimes they do class visits.

Are all activities done by subject advisors beneficial to the teaching and the results of Physical Science at your school?

Yes, checking the books and the ATP and class visits helps a lot.

How is the working relationship between you the Physical Science subject advisor at your school? Give reasons

100%.

How involved have you been in assisting Physical Science subject advisors to reinforce their support for teachers?

I become honest, if there is something I don't hide it, I make sure that they understand our needs.

Are you satisfied with the current Physical Science advisor for your school? Give reasons.

Yes, they are good in the subject.

In the event you are not satisfied with the subject advisor, what would you do?

I will discuss with the subject advisor, if I don't get help will go to the immediate senior.

How is the relationship between subject advisors and Physical Science teachers?

Fine, they work together as a team.

How has the relationship between subject advisors and Physical Science teachers affected the quality of teaching of Physical Science at your school?

Our result have improved because of the god relationship.

What is your view on the professional qualities of the Physical Science subject advisors and how that has influenced those of Physical Science teachers at your school?

They are too professional.

How frequent does the Physical Science subject advisor visit schools?

Two times per term.

Are you personally satisfied with the current Physical Science advisor? What qualities does he/she display that make you to be satisfied OR what qualities does he/she display that make you to be dissatisfied?

Yes. I'm satisfied.

What is the attitude of teachers at your school towards Physical Science subject advisors?

According to my observation they get along fine.

How do you regard the commitment of the Physical Science subject advisor in improving the results of your school or maintain good performance?

They are committed. If not they wouldn't be coming to our school.

From the reports received from your teachers do you regard the Physical Science subject advisor as being knowledgeable enough to enhance the quality of Physical Science results at your school?

Yes.

How confident are you in the content and pedagogical content knowledge that teachers receive from your subject advisor?

Its ok, I have not received any complaint from the teachers.

How has the subject advisor assisted Physical Science teachers to cope with curriculum changes?

Cluster meetings and giving the material.

How has the intervention by the subject advisor affected the Physical Science results at your school in the past five years?

Our results have been improving except for last year, but that was because of our internal issues.

What are challenges that teachers encounter about subject advisors that negatively impacts on the quality of their teaching? How do you deal with challenges?

I have not been aware of any challenge at my school.

What are challenges that school principals encounter about subject advisors that negatively impacts on the quality of Physical Science learner performance? How do you deal with challenges?

None with me.

If there is a room for suggested improvement on the roles of subject advisors, what would you want them to be and how do you think it would impact the performance of Physical Science at your district?

So far everything is fine.

ANNEXURES K-3: INDIVIDUAL INTERVIEW QUESTIONS FOR PHYSICAL SCIENCE TEACHERS

In trying to answer the question:

- **What are the views of Physical Science teachers on the role that Physical Science subject advisors have in enhancing the quality of the teaching of Physical Science in the FET phase (grade 10-12).**

… the following question was asked:

What is your view on the relevance of subject advisor on the current education system?

Subject advisors are relevant for support in content and methodology.

What is your perception on the acceptance of Physical subject advisor’s by Physical Science teachers and the principal at your school?

Teachers accept subject advisors-principals involve them in most of the decisions including appointment of teachers.

What is the impact that Physical Science subject advisors have on the quality on the quality of Physical Science teaching and the quality of Physical results?

Content workshops have improved the quality of my teaching.

What is your observation on subject advisors' interest and commitment in assisting teachers to improve the quality of the teaching of Physical Science at schools?

She is very committed in assisting me ,anything I ask from her she will assist

List exact activities that subject advisors are do when they visit your schools?

Asks for learners books to moderate
Checks lesson plans
Moderate SBA tasks
Visits me in class to observe teaching practice

Are all activities done by subject advisors beneficial to the teaching and the results of Physical Science at your school?

Not all of them. The files do not have any impact on my teaching.

How is the relationship between your subject advisor and Physical Science teachers at your school

Good.

How has the relationship between subject advisors and Physical Science teachers affected the quality of teaching of Physical Science at your school?

I am free to call her anytime.

What is your view on the professional qualities of the Physical Science subject advisors and how that has that influenced those of Physical Science teachers at your school?

She is very professional; she has a lot of respect for me and my work.

How frequent does the Physical Science subject advisor visit schools?

Once per month, but twice if there is a need for follow up.

How has the frequency of the school visits by subject advisors to schools affected the quality of teaching of Physical Science?

Sometimes it doesn't help much, especially when we discuss how to present lesson plans.

What role can be played by subject advisors in ensuring that teachers commitment and interest in teaching Physical Science.

She mentors me; she assists me in terms of how to present the content because I know the content.

What is the attitude of teachers at your school towards Physical Science subject advisors?

I am the only Physical Science teacher at our school and I have a good relationship with her.

Are you personally satisfied with the current Physical Science advisor? What qualities does he/she display that make you to be satisfied OR what qualities does he/she display that make you to be dissatisfied?

Yes. The support she gives me and our relationship is good.

In trying to answer the question:

- **What impact does the Physical Science subject advisors' content and pedagogical content knowledge have on quality of the teaching of Physical Science in the FET phase (grade 10-12)?**

… the following questions were asked :

Do you regard the Physical Science subject advisor as having sufficient Physical Science knowledge to enhance the quality of Physical Science results at your school?

She is knowledgeable in both Physics and Chemistry.

In the event you are not satisfied with the subject advisor, what have you done?

I am satisfied.

What kind of intervention strategies has the subject advisor employed to assist teachers in your school with content and pedagogical content knowledge?

We discuss topics and teaching approaches. She advises on how to approach topics. After analysing the results she advises me on strategies for improvement.

n your school how has the intervention by the subject advisor affected the content and pedagogical content knowledge of Physical Science teachers?

My teaching and assessment methods have improved.

How confident are you in the content and pedagogical content knowledge you receive from your subject advisor?

In most content that she has helped me with I feel confidant, but sometimes her methods are confusing.

In the event where you are not confidant, how have you dealt with it?

I go to my mentor that she has assigned to me.

In trying to answer the question:

- **How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?**

… the following question was asked:

What challenges about Physical Science teachers are faced by subject advisors that hinder them from effective Physical Science subject support?

Some teachers, when they know that the subject advisor is coming to their school they become dodgy because they know they do not have the required documents.

What challenges about school principals are faced by subject advisors that hinder them from effective Physical Science subject support?

In my case our principal involves the subject advisor all the time, sometimes he uses her to force me to do things I don't want to do.

If there is a room for suggested improvement on the roles of subject advisors, what would you want them to be and how do you think it would impact the performance of Physical Science at your district?

In solving issues at schools this should not merely be paper work given to school principals but paper explanation and guidance for teachers.
When there are complaints, these should be handled professionally, first with the HoD then the principal. Reduce the required paper work-it is too much and does not improve results.

ANNEXURE L: GROUP INTERVIEWS FOR FOCUS GROUPS

ANNEXURE L-1: GROUP INTERVIEWS FOR FOCUS GROUP 1

The following questions were asked to focus groups as points of discussions.

1 What impact does the Physical Science subject advisors' content and pedagogical content knowledge have on quality of the teaching of Physical Science in the FET phase (grade 10-12)?[base your responses on the following questions]

Do you think that your subject advisor has sufficient Physical Science content knowledge to reinforce the content knowledge that you already have? Elaborate based on the Physical and content knowledge

Yes, sufficient but not enough as she is good in Chemistry than in Physics.

Do you think that your subject advisor has sufficient Physical Science pedagogical content knowledge to reinforce the pedagogical content knowledge that you already have? Elaborate based on teaching strategies received from the subject advisor.

Yes, the subject advisor used to shoe us howto approach some topics and to show the important o content we need to teach for example for properties of Organic molecules we were advised to revise grade 11 work on intermolecular forces.

How has the content and pedagogical content knowledge of your subject advisor enhanced your quality of teaching and the quality of Physical Science results at your school?

The quality of teaching has improved but were not as good as the quality because learners themselves are not serious, they did not even revise on their own so that they can ask what they do not understand.

What are the views of Physical Science teachers on the role that Physical Science subject advisors have in enhancing the quality of the teaching of Physical Science in the FET phase (grade 10-12).

What is your opinion on the **relevance** of Physical Science subject advisory at schools?[some points that can help answer the questions are:

Do you regard the subject advisor as a support system for the subject or as inspectors who are on a fault finding mission?

Subject advisors are our support system.

Has the presence of the subject advisor helped you to be developed professionally in the subject/ the teaching methods or would the school structure do fine on its own without the subject advisor?

Yes, workshops are conducted every term on content.

Has the subject advisor helped with mentoring or guiding you in mentoring or getting mentoring from other colleagues?

Yes, they encourage team teaching in the subject and specialization, one in Chemistry and the other in Physics.

Other additional comments:

What is your view on the effectiveness of your Physical Science subject advisor(s) in improving teaching practice and. or the teaching methods? *Responses should be based on:*

The support in content/ workshops for content and pedagogical support/support group meetings.

Our subject advisors are effective because workshops on content are organised during workshop, group discussions are encouraged.

Teaching resources like support material provided: do you get any relevant quality support resource from the subject advisor and how have they impacted on your teaching and quality of results?

Yes, we are provided with materials. On quality of teaching they help a great deal but in terms of results there is a big challenge because of the types of learners we have.

Guidance and advice on professional and personal factors that can influence your effectiveness in teaching:

Have you received any guidance that has helped you to improve as a person and as a Physical Science teacher from your subject advisor, examples are the subject advisor being empathetic in your challenges, supportive in personal issues that may affect your teaching effectiveness and advise on how to enhance your professional growth such as advising and assisting in research of teaching material, advise on further study, sharing resources from other district etc.?

Yes, our subject advisor always guides us even on personal issues like when you are on sick leave when you come back they advise us on how to catch up and during our absence they come to help where they can.

What are the exact activities that subject advisors when they come to your school? Do the activities of subject advisors help improve your teaching practice and content or the results of the subject, how?[write the activity and its impact next to it?

Sometimes they come and teach for teachers especially for topics that are challenging to educators.

How have you benefited from the subject advisor since he/she has been supporting you?[base your response on content knowledge, teaching method ,assessment practices, intervention strategies, relations with other Physical

Science teachers colleagues in the school /district/province.

In our district we have cluster groups for schools that are underperforming to help on strategies to improve results on challenging topics.

How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?

I think subject advisors are doing a lot for educators. I think for now they have to concentrate on helping with learners because they are the ones who write examinations. Maybe they can do enough to motivate learners.

ANNEXURE L-2: GROUP INTERVIEWS FOR FOCUS GROUP 2

The following questions were asked to focus groups as points of discussions.

What impact does the Physical Science subject advisors' content and pedagogical content knowledge have on quality of the teaching of Physical Science in the FET phase (grade 10-12)?[base your responses on the following questions]

Do you think that your subject advisor has sufficient Physical Science content knowledge to reinforce the content knowledge that you already have? Elaborate based on the Physical and content knowledge.

She has sufficient knowledge to reinforce content knowledge. She even gives strategies and makes it more practical. She knows it and does not even read a note, just says it.

Do you think that your subject advisor has sufficient Physical Science pedagogical content knowledge to reinforce the pedagogical content knowledge that you already have? Elaborate based on teaching strategies received from the subject advisor.

She gives us different strategies to teach the content and allow us to give our strategies and always encourage us to do the right things.

How has the content and pedagogical content knowledge of your subject advisor enhanced your quality of teaching and the quality of Physical Science results at your school?

It makes me to enjoy it and make my work very much simple and loved by learners.

What are the views of Physical Science teachers on the role that Physical Science subject advisors have in enhancing the quality of the teaching of Physical Science in the FET phase (grade 10-12).

What is your opinion on the **relevance** of Physical Science subject advisory at schools?[some points that can help answer the questions are:

Do you regard the subject advisor as a support system for the subject or as inspectors who are on a fault finding mission?

She is a support system because if you don't do something right she advises and does fllow up. She makes sure that there are no gaps.

Has the presence of the subject advisor helped you to be developed professionally in the subject/ the teaching methods or would the school structure do fine on its own without the subject advisor?

It has developed us and makes our work much simple and easy to teach our learners to love the subject and to realise that Physical Science is not very difficult.

Has the subject advisor helped with mentoring or guiding you in mentoring or getting mentoring from other colleagues?

She likes us to work together with neighbouring schools. As Physical Science we speak the same knowledge as her. She makes us to go an extra mile at it is what she does.

Other additional comments:

What is your view on the effectiveness of your Physical Science subject advisor(s) in improving teaching practice and. or the teaching methods? *Responses should be based on:*

The support in content/ workshops for content and pedagogical support/support group meetings.

She always encourages group work, always.

Teaching resources like support material provided: do you get any relevant quality support resource from the subject advisor and how have they impacted on your teaching and quality of results?

If you lack something, you get it. Sometimes if she does not have it she connects us with people who have it. She never lets us down

Guidance and advice on professional and personal factors that can influence your effectiveness in teaching:

Have you received any guidance that has helped you to improve as a person and as a Physical Science teacher from your subject advisor, examples are the subject advisor being empathetic in your challenges, supportive in personal issues that may affect your teaching effectiveness and advise on how to enhance your professional growth such as advising and assisting in research of teaching material, advise on further study, sharing resources from other district etc.?

She is supportive in everything even in personal issues; advise us in further studies and sharing resources, lesson plans, diagnostic results, exam guidelines. She gives us everything about Physical Science.

What are the exact activities that subject advisors when they come to your school? Do the activities of subject advisors help improve your teaching practice and content or the results of the subject, how?[write the activity and its impact next to it?

Every bulletin in the CAPS documents she checks if we did it and we have given classwork's, tests etc. She makes sure that we don't skip anything and different tasks are given to each topic.

How have you benefited from the subject advisor since he/she has been supporting you?[base your response on content knowledge, teaching method ,assessment practices, intervention strategies, relations with other Physical Science teachers colleagues in the school /district/province.

More understanding of the content, using different methods in teaching and other ways for learners to understand using multiple choice questions, definitions before attempting calculations. She helped me to all types of learners to pass. What is important in Physical Science is for learners to understand the questions before looking for answers.

How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?

She is doing very good, I don't see any improvement required for her.

ANNEXURE L-3: GROUP INTERVIEWS FOR FOCUS GROUP 3

The following questions were asked to focus groups as points of discussions.

What impact does the Physical Science subject advisors' content and pedagogical content knowledge have on quality of the teaching of Physical Science in the FET phase (grade 10-12)?[base your responses on the following questions]

Do you think that your subject advisor has sufficient Physical Science content knowledge to reinforce the content knowledge that you already have? Elaborate based on the Physical and content knowledge

Not, not on a single instance has he facilitated /presented a content workshop.

Do you think that your subject advisor has sufficient Physical Science pedagogical content knowledge to reinforce the pedagogical content knowledge that you already have? Elaborate based on teaching strategies received from the subject advisor.

Most of the content received is from other subject advisors (from other subjects and from other districts)

How has the content and pedagogical content knowledge of your subject advisor enhanced your quality of teaching and the quality of Physical Science results at your school?

Not his

What are the views of Physical Science teachers on the role that Physical Science subject advisors have in enhancing the quality of the teaching of Physical Science in the FET phase (grade 10-12).

What is your opinion on the **relevance** of Physical Science subject advisory at schools?[some points that can help answer the questions are:

Do you regard the subject advisor as a support system for the subject or as inspectors who are on a fault finding mission?

No. Subject support is not enough.

Has the presence of the subject advisor helped you to be developed professionally in the subject/ the teaching methods or would the school structure do fine on its own without the subject advisor?

He has helped me on other issues like compliance to the CAPS policy and is a very supportive person.

Has the subject advisor helped with mentoring or guiding you in mentoring or getting mentoring from other colleagues?

No

Other additional comments:

What is your view on the effectiveness of your Physical Science subject advisor(s) in improving teaching practice and. or the teaching methods? ***Responses should be based on:***

The support in content/ workshops for content and pedagogical support/support group meetings.

He organizes workshops where teachers come and share their good practices /strategies.

Teaching resources like support material provided: do you get any relevant quality support resource from the subject advisor and how have they impacted on your teaching and quality of results?

The support is adequate

Guidance and advice on professional and personal factors that can influence your effectiveness in teaching:

Have you received any guidance that has helped you to improve as a person and as a Physical Science teacher from your subject advisor, examples are the subject advisor being empathetic in your challenges, supportive in personal issues that may affect your teaching effectiveness and advise on how to enhance your professional growth such as advising and assisting in research of teaching material, advise on further study, sharing resources from other district etc.?

At least this year we received common experiments to administer with learners.

What are the exact activities that subject advisors when they come to your school? Do the activities of subject advisors help improve your teaching practice and content or the results of the subject, how?[write the activity and its impact next to it?

- To check compliance of policy documents and ATP and SBA completion.
- Check assessment (if questions asked/given to learners cater all levels of the taxonomy.

How have you benefited from the subject advisor since he/she has been supporting you?[base your response on content knowledge, teaching method ,assessment practices, intervention strategies, relations with other Physical Science teachers colleagues in the school /district/province.

He helped me to have good relations with other teachers.

How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?

For subject advisors to support teachers especially with content and not be fault finders and to them to talk to teachers professionally.

ANNEXURE L-4: GROUP INTERVIEWS FOR FOCUS GROUP 4

The following questions were asked to focus groups as points of discussions.

What impact does the Physical Science subject advisors' content and pedagogical content knowledge have on quality of the teaching of Physical Science in the FET phase (grade 10-12)?[base your responses on the following questions]

Do you think that your subject advisor has sufficient Physical Science content knowledge to reinforce the content knowledge that you already have? Elaborate based on the Physical and content knowledge

I know she has sufficient Physical Science content. She can also relate it to everyday life situations.

Do you think that your subject advisor has sufficient Physical Science pedagogical content knowledge to reinforce the pedagogical content knowledge that you already have? Elaborate based on teaching strategies received from the subject advisor.

She encourages us to approach our teaching using basic knowledge connecting it to the scientific knowledge.

How has the content and pedagogical content knowledge of your subject advisor enhanced your quality of teaching and the quality of Physical Science results at your school?

She provides strategies on how to handle topics in a way that even the weaker learner can be able to collect marks.

What are the views of Physical Science teachers on the role that Physical Science subject advisors have in enhancing the quality of the teaching of Physical Science in the FET phase (grade 10-12).

What is your opinion on the **relevance** of Physical Science subject advisory at schools?[some points that can help answer the questions are:

Do you regard the subject advisor as a support system for the subject or as inspectors who are on a fault finding mission?

She provides different materials to deal with the same topic and provide different approaches to the same problem.

Has the presence of the subject advisor helped you to be developed professionally in the subject/ the teaching methods or would the school structure do fine on its own without the subject advisor?

Yes, she facilitates workshops and provides electronic materials which support teachers.

Has the subject advisor helped with mentoring or guiding you in mentoring or getting mentoring from other colleagues?

She has provided us with teaching materials that helps HODs to run subject meetings at schools.

Other additional comments:

She has given us strategies on how to complete tasks. She organized learners to attend camps offered by DoBE.

What is your view on the effectiveness of your Physical Science subject advisor(s) in improving teaching practice and. or the teaching methods? *Responses should be based on:*

The support in content/ workshops for content and pedagogical support/support group meetings.

We have monthly meetings which support us in terms of content.

Teaching resources like support material provided: do you get any relevant quality support resource from the subject advisor and how have they impacted on your teaching and quality of results?

Yes, she provides a support material like cd's which have most previous trial question papers from different provinces. This makes our job a little bit easier. We no longer struggle to get previous papers.

Guidance and advice on professional and personal factors that can influence your effectiveness in teaching:

Have you received any guidance that has helped you to improve as a person and as a Physical Science teacher from your subject advisor, examples are the subject advisor being empathetic in your challenges, supportive in personal issues that may affect your teaching effectiveness and advise on how to enhance your professional growth such as advising and assisting in research of teaching material, advise on further study, sharing resources from other district etc.?

She comes and do class visits to see how we unpack the content and she intervenes in case there are misconceptions and provide guidance.

What are the exact activities that subject advisors when they come to your school? Do the activities of subject advisors help improve your teaching practice and content or the results of the subject, how?[write the activity and its impact next to it?

She helps teachers in areas where they have challenges and show them how to deal with the challenges.

How have you benefited from the subject advisor since he/she has been supporting you?[base your response on content knowledge, teaching method ,assessment practices, intervention strategies, relations with other Physical Science teachers colleagues in the school /district/province.

We have improved in assessing learners and in remedial for struggling learners.

How can the support and development given by subject advisors to Physical Science teachers be improved or amended in order to increase the quality and quantity of Physical Science results?

So far she has been very helpful and relevant to every area of the challenge. Her continuous support is appreciated and our wish is that it is sustained and continues and gets carried over to us as we can be able to carry on with the legacy of providing help.